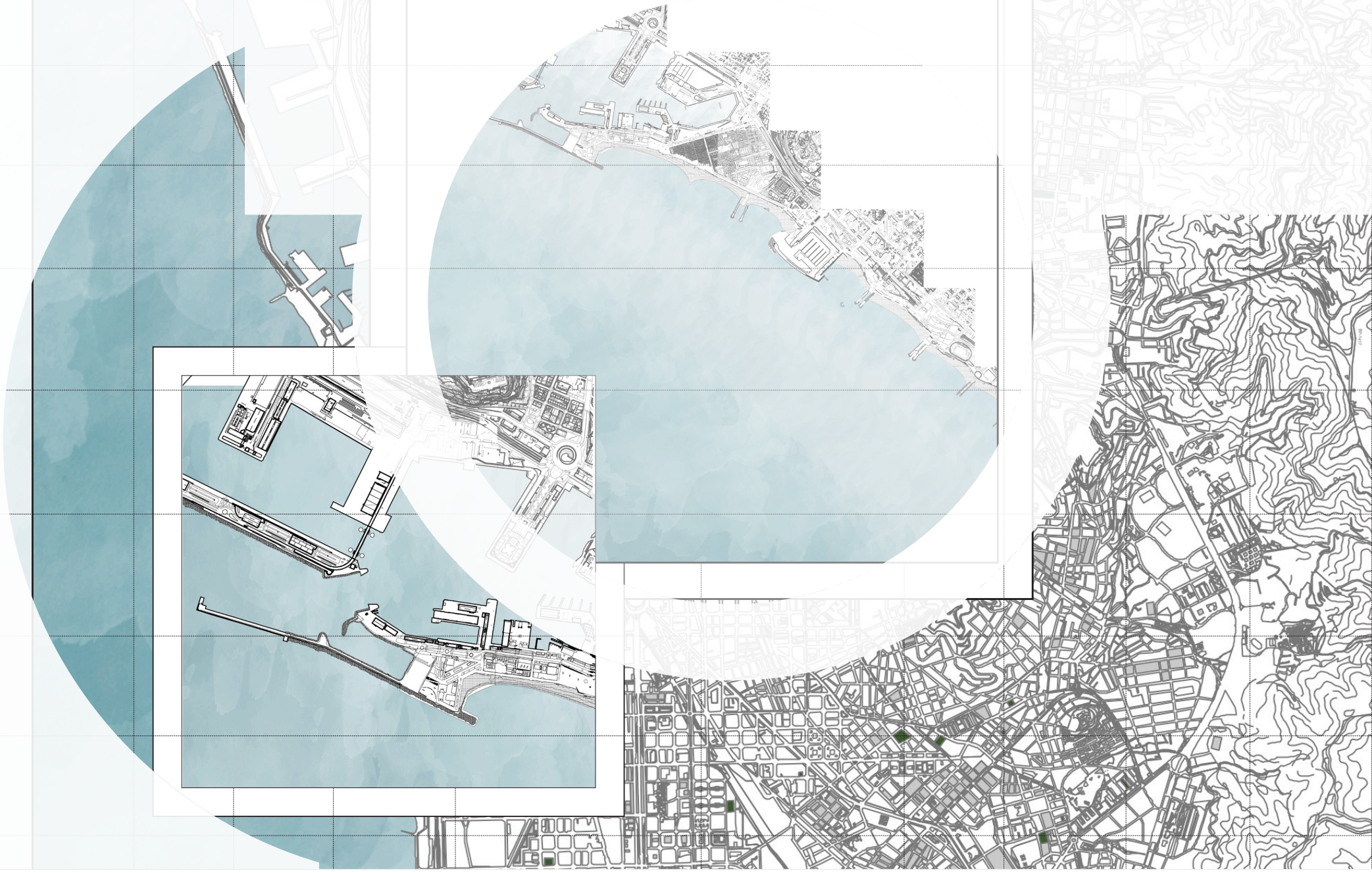

F L O A T I N G

Architecture for a dynamic society / *Water as a media to explore flexibility*

ETSAB Escola Tècnica Superior d'Arquitectura de Barcelon

ETSAB MBDesign

Universitat Politécnica de Catalunya (UPC)
Escola Técnica Superior de Arquitectura (ETSAB)
Master in advanced studies in Design MBDESIGN
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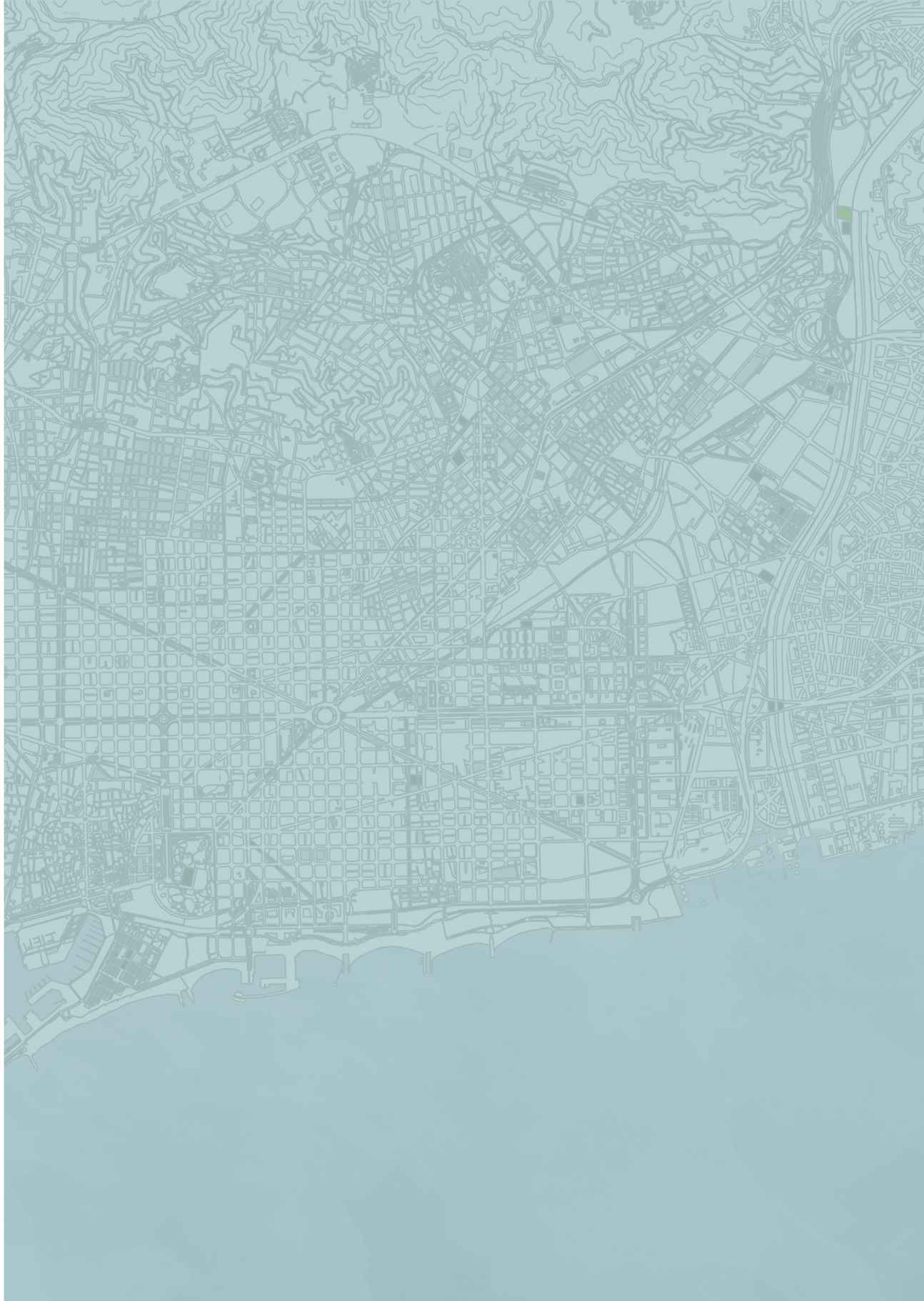
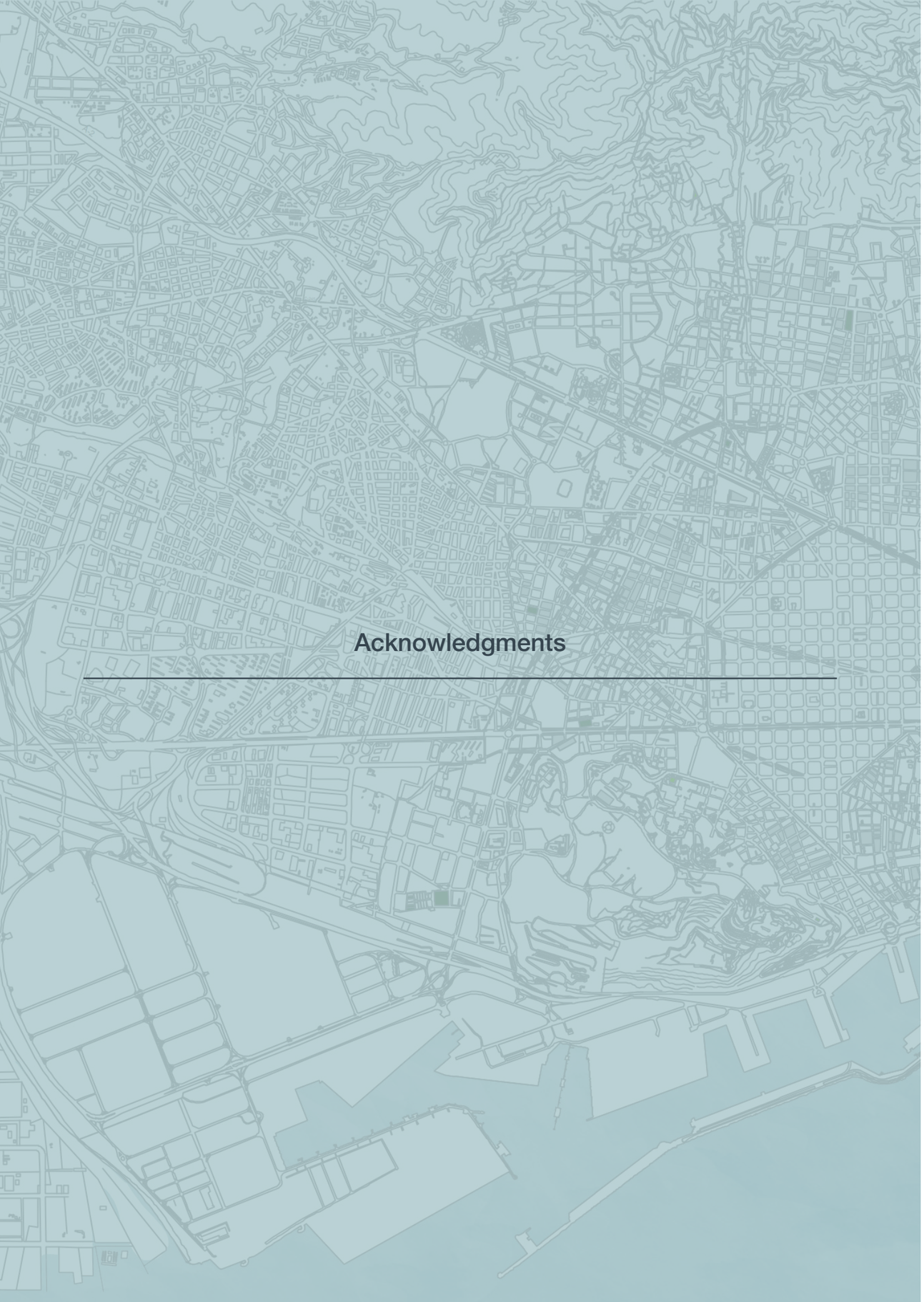
Coordination: Josep Maria Fort



Floating Architecture for a dynamic society

Water as a media to explore flexibility

Layming Chang De Leon



Acknowledgments

First to God for allowing this experience and knowledge, To my parents, Amparo and Ernesto who even in the distance were giving me daily unconditional encouragement just as my siblings Ling Yin and Kuang Li. Joan, thank you for making the journey way more fun, Friends and professors for the unfailing guidance. Tutor Josep M. Fort for the suggestions and support.

CONTENT


00

Abstract

In the not too distant past, the capacity for speedy response to change was the key factor in the survival of the species. Nowadays, we find ourselves in continuously changing environments. The modern society or liquid society, is described by Zugmunt Bauman as a society based on individualism, temporary and unstable behavior, that lacks solid aspects, compared to the fixed structures of our past.

Recent changes in society forced by culture, economics, technology, and ecological considerations are instigating a new examination of the way we create the buildings that support life and work, and this changes and evolve at different rhythms, what has vary today, is the speed in wich those occurs.

After gathering and understanding the dynamic society we confront today, the floating architecture is taken as a typology of implementing a modular system that seeks to implement flexibility and modulation on a changing use, supporting the ongoing integration of land and water, taking water as a media to explore what is necessary for a dynamic world, as it can be placed on water, it brings the ability to be relocated and reused in other locations.

The context that has molded and given expression to man's attitude towards the water is explored, examining how cities and civilizations have been drawn to this element since ancient time, including the water as a source of symbolism, aesthetic pleasure or as a therapeutic value.

Where is the architecture leading? How is it going to be? By asking this, there are countless interventions that may be thrown into thinking, why should this change? Is it in the hands of the architects to propose a way to confront this consequences?

Architectural projects will not necessarily remain static, human beings have always made tools that respond to needs and this changes and improve with regard to developing situations.

The project seeks to create an urban canvas that registers the lives, dreams, and aspirations of current and future environments, as to encourage the importance of the development, management and control of water resources oriented to both the climate and its effects on the land, as well as the architectural response to these effects.

Resumen

En un pasado no muy lejano, la capacidad de respuesta rápida al cambio fue el factor clave en la supervivencia. Hoy en día, nos encontramos en entornos en constante transformación. La sociedad moderna o sociedad líquida, es descrita por Zugmunt Bauman como una sociedad basada en el individualismo, el comportamiento temporal e inestable, el cual carece de aspectos sólidos, en comparación con las estructuras fijas de nuestro pasado.

Los cambios recientes en la sociedad forzados por la cultura, la economía, la tecnología y el cambio climático están instigando una nueva forma en la que creamos los edificios que sustentan la vida y el trabajo, y esto cambia y evoluciona a diferentes ritmos, lo que ha variado hoy, es la velocidad en la que estos ocurren.

Después de comprender la sociedad dinámica a la que nos enfrentamos hoy, la arquitectura flotante se toma como una tipología de implementación de un sistema que busca implementar flexibilidad y modulación en un uso cambiante, apoyando la integración continua de la tierra y el agua, tomando el agua como medio para explorar lo que es necesario para un mundo dinámico. Al ser ubicado en el agua, ofrece la posibilidad de ser reubicado y reutilizado en otros lugares.

Se explora el contexto que ha moldeado y le ha dado expresión a la actitud del hombre hacia el agua, examinando cómo las ciudades y las civilizaciones se han sentido atraídas por este elemento desde la antigüedad, incluyendo el agua como fuente de simbolismo, placer estético o valor terapéutico.

¿Hacia dónde se dirige la arquitectura? ¿Cómo va a ser? Al preguntar esto, hay innumerables intervenciones que pueden ser lanzadas al pensamiento, ¿por qué debería cambiar esto? ¿Está en manos de los arquitectos proponer una forma de enfrentar estas consecuencias?

Los proyectos arquitectónicos no necesariamente permanecerán estáticos, los seres humanos siempre han creado herramientas que responden a las necesidades y estas cambian y mejoran con respecto a las situaciones en desarrollo.

El proyecto busca crear un lienzo urbano que registre las vidas, los sueños y las aspiraciones de los entornos actuales y futuros, para alentar la importancia del desarrollo, gestión y control de los recursos hídricos orientados tanto al clima como a sus efectos sobre la tierra, así como la respuesta arquitectónica a estos desenlaces.

Research Questions

1 Why should we think in dynamic, flexible and adaptable architecture? Where did it started?

2 Is it the way in which society interacts with architecture that makes changes possible?

3 How can floating architecture confronts the design development in a dynamic society world?

Methodology

This work is classified in the field of exploratory research, a first approach to the problem is studied. The results of this type of research will give a panorama of the subject formulated wich can be retaken in further investigations, since the floating architecture is a nowadays trend.

The work is divided in a theoretical part wich analyses the concept of “dynamic or liquid society”. After the general, cultural and historical context that has molded and given expression to man’s attitude towards the water is explored, examining how cities and civilizations have been drawn to this element since ancient times.

Case studies are expressed in order to visualize the different typologies and scales in wich this type of architecture is being used. The floating architecture is examined in response to flexible society, taking into account the factors that caused it, advantages, the types of structures and floating architecture that exists.

Aiming to develop a project that could face changes due to its flexible interaction with the user, allowing it to be set up in different places and arrangements according to public collective activities.


01

“*The Impact of accelerating change on the physical form of the city is radical. Institutions have shorter and shorter lives - railway stations are converted into museums, power plants into art galleries, churches into night-clubs, warehouses into homes - and it is now commonplace to anticipate that a building will outlive the purpose for which it is built in a matter of a few years. Modern life can no longer be defined in the long term and consequently cannot be contained within a static order of symbolic buildings and spaces [...] Buildings no longer symbolise a static hierarchical order: instead, they have become flexible containers for use by a dynamic society.*”

Richard Rogers
Cities for a small Planet, 1997, p.163

Introduction

The world is changing around us. What was unthinkable before, finds shape and develops in front of our eyes, pointing towards a different way of thinking about how we live.

This work investigates the study of different aspects that involve the relation between humankind and water in order to arrive to a response on how since dawn civilizations transient has been a word that has been used to describe our life’s, so it’s a concept that mankind is familiar with.

It is my genuine interest to follow floating architecture since nowadays is our present and near future to develop an architecture that serves the contemporary society, as designers that is to say, we must embrace and respond to the state of exchange, transfer, relocation or adaption, rethinking the way we inhabit the water.

Instead of fighting to what will come, we should adapt and face it. Buildings are ideas made physical, they carry and manifest cultures and even technologies.

By knowing this, there have been a lot of answers on how the architecture has adapted to conditions that not only required an actual context study but a future projection and how those changes will affect the infrastructure that will be designed, and therefore, arrive to a precise proposal.

01

Dynamic Society

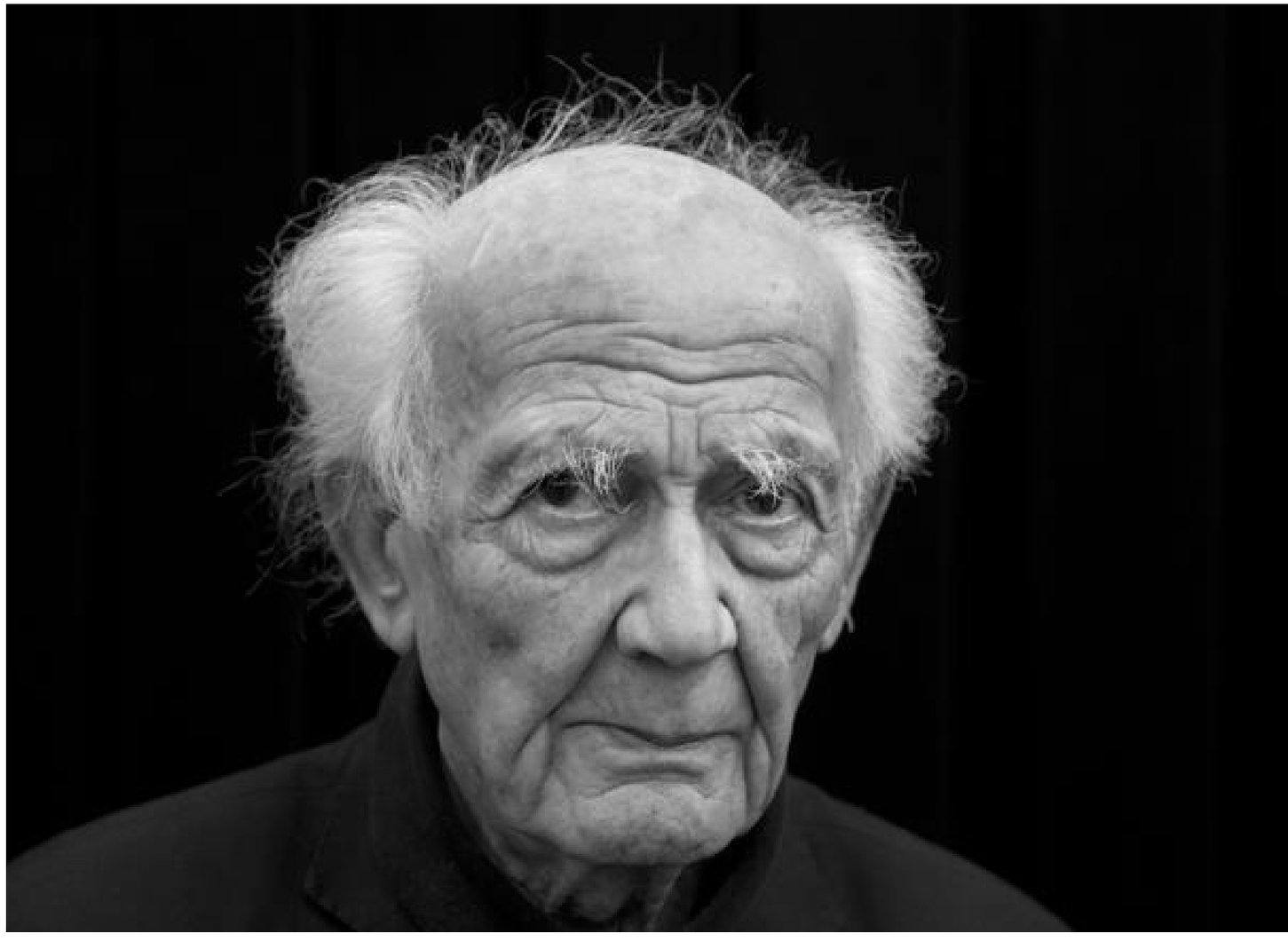


Fig. 1, Bauman Zygmunt, Photo by Pedro Madueño, Source: http://www.lavanguardia.com/cultura/20170109/413213624617/modernidad-liquida-zygmunt-bauman.html

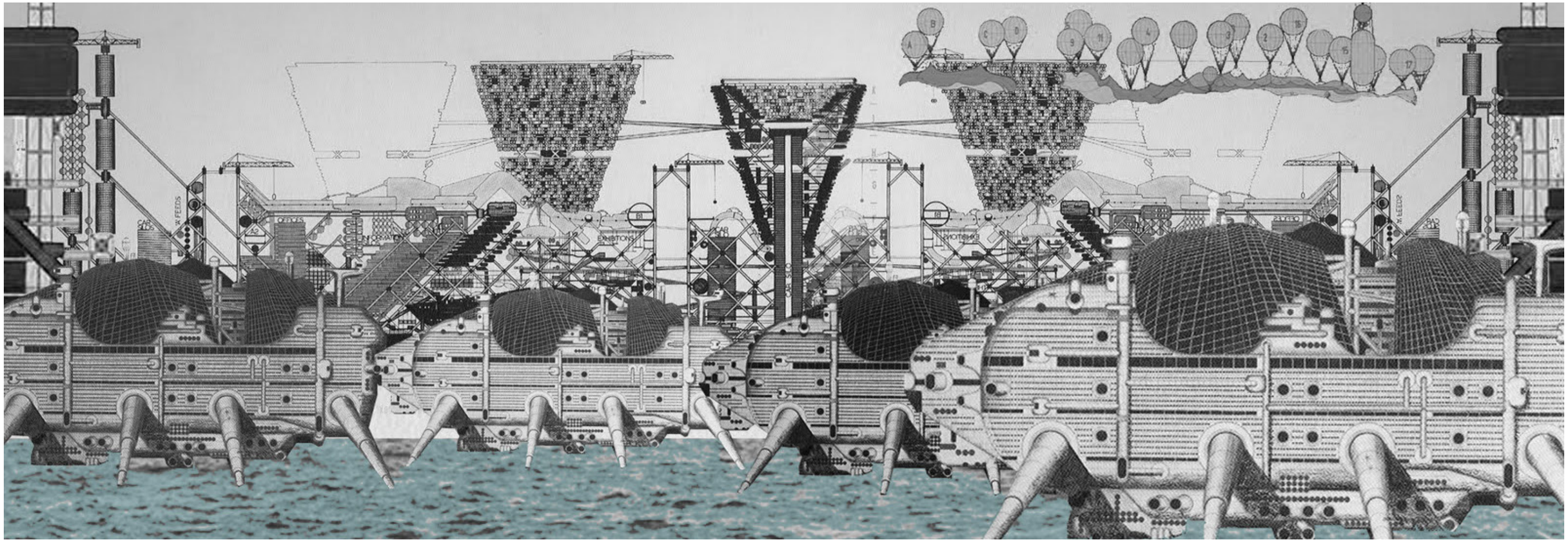


Fig. 2. Walking City, Peter Cook & Archigram, 1964 Source: https://nocloudinthesky.wordpress.com/2013/01/24/archigram-prefab/

Human beings are flexible individuals who are mobile, creative, and capable of operating in a wide range of environments.

In the not too distant past the capacity for speedy response to change was the key factor in the survival of the species. Recent changes in society forced by culture, economics, technology, and ecological considerations are instigating a new examination of the way we create the buildings that support life and work.

Human beings have always made tools that respond to our needs and are changed and improved with regard to developing situations.

The modern society finds himself in a continuously changing environment.

Transient has been a word that has always been used to describe our life's, so it's a concept wich mankind is familiar with. Recent changes in our society are being faced due to geographical, economical and social situations and this changes and evolve at different rhythms. What has vary in today time, is the speed in wich those occurs

The world is changing, so its architecture, every day new construction methods and materials are implemented, leading us to a new way on thinking how we are living, and to the imagination the opportunity to produce unique results.

Globalization can be defined as "the technological and economic influences that force us together worldwide".[1]

Technology has transformed the world into a global phenomenon. We can consider ourselves as "Neo-nomads" because it is urge that we now have it easier to be more ambitious, to expand to other cities and countries, as students, travelers, entrepreneurs, even like soldiers, so this brings that we are facing constant change or we know people that has been changing environments constantly wich make us have a "flexible" way of thinking.

Due to this alterations we need to estimate and arrive to a solution were each ambit were the humankind so its architecture can be affected, and create a response to possible evolutions and improvements, creating with this way, an adaptable, flexible architecture wich adapts to the society that answers to the same concept.

"In a technological society more people will play an active part in determining their own individual environment, in self determining a way of life" [2]

[1] Hubert-Jan Henket, & Hilde Heyen, Back from Utopia. The Challenge of the Modern Movement, 2002, p.14

[2]Chalk, W. (1963) "Housing as a consumer product." Reprinted in T. Stoos (ed.) (1994) A guide to Archigram: 1961-74. London: Academy Editions

“Over the centuries, nomadic life has offered humanity real possibilities for fulfillment, revealing to the individual a sense of participation in the cultural order and the natural world. Whether for the bedouin in the desert or the christian pilgrim in the Middle ages, enacting our condition of passerby upon the face of the earth by walking and belonging to no permanent physical place held a profound significance.”

(Perez-Gomez, Alberto,2006, Transportable environments vol.3 Taylor & Francis, Pag 2-3.)

According to Zygmunt Bauman, the society is based on individualism and has become something temporary and unstable that lacks solid aspects, wich compared of the fixed structures of the past, we now facing “expiration dates”

Archigram illustrated and showed their desire to flexible architecture, they wanted to produce a work that responds to situations not a defined structure that resisted to transformations, for them, architecture had to explore technology in advance to become flexible. In projects like Instant City (Fig. 2) and Walking City (Fig. 3) their ideas can be demonstrated.

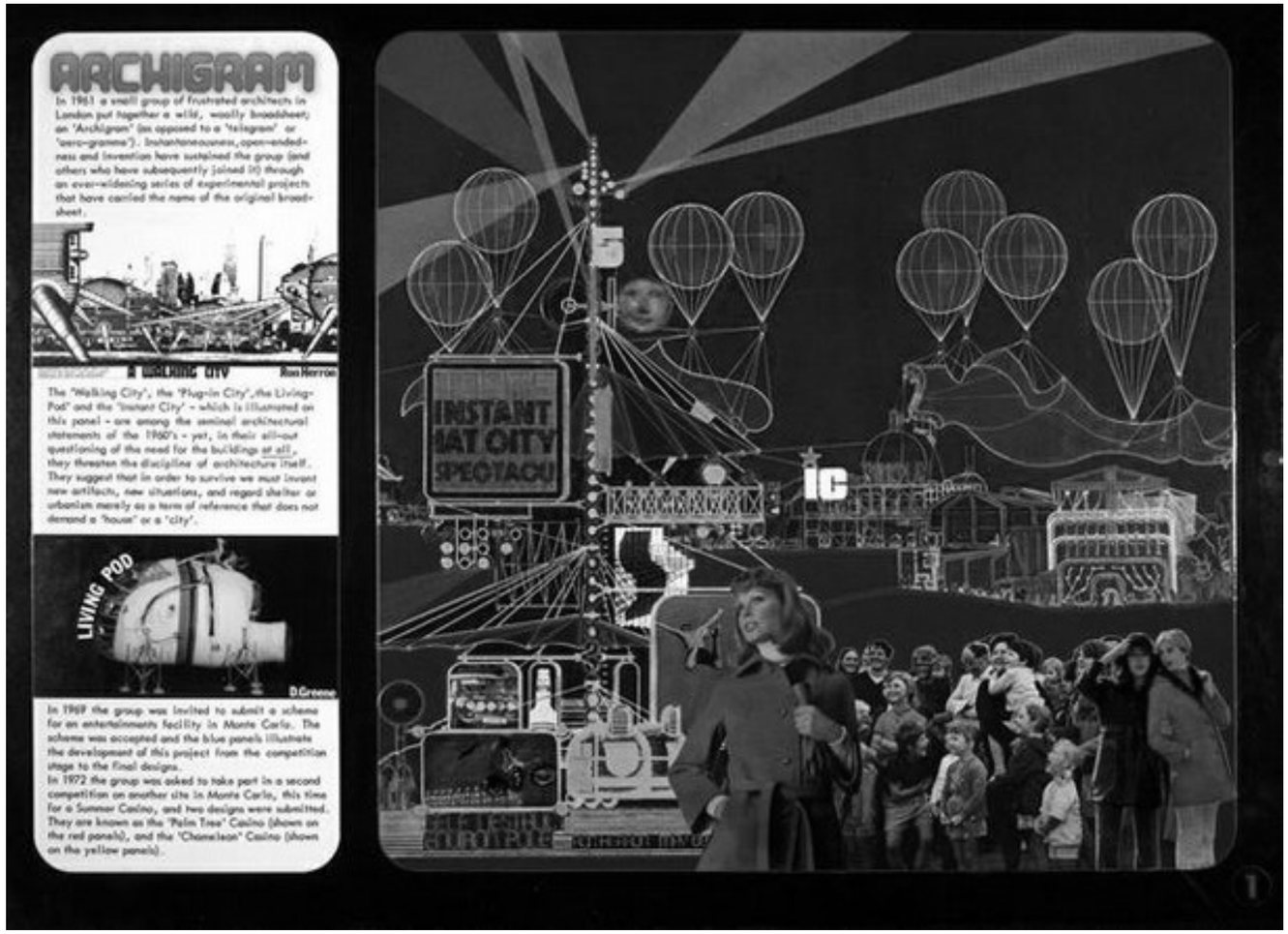
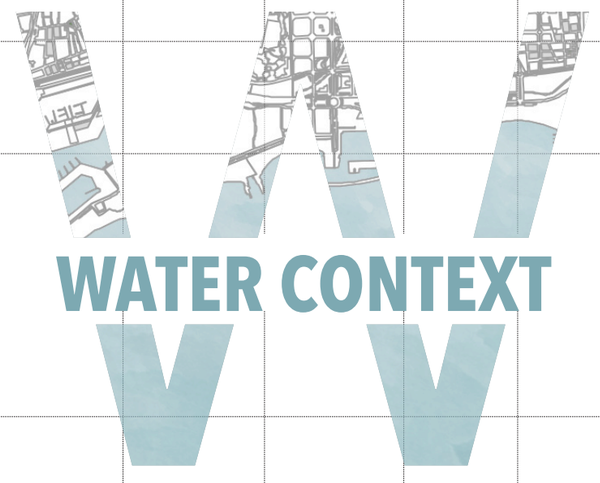


Fig. 3. Walking City, Peter Cook & Archigram, 1964 Source: https://nocloudinthesky.wordpress.com/2013/01/24/archigram-prefab/

02



WATER CONTEXT

Watercontext

2. Water as a resource
2.1 Water as an element
2.1.1 Symbolic value
2.1.2 Aesthethic pleasure
2.2 Water as territory

Water as a resource.

In this chapter, the general, cultural and historical context that has molded and given expression to man's attitude towards the water is explored, examining how cities and civilizations have been drawn to this element.

Water is the most plentiful element of our planet to this is attributed the basis for the existence of man, it is considered the origin of life, without wich no living thing could survive.

"It is the archaic and ambivalent nature that ultimately defines human relationships with water. Water may be the most indispensable of the elements, for life itself, improving life and for daily use, so wrote Vitruvius (60-10 BC)" (Meyhofer, D., & Haines, D. J (2011).

In the dawn of civilizations, the centers for populations were developed along rivers, lakes and streams. Because of this, man has had a planning of increasingly complex and effective systems for conservation, transportation and adaptation to different uses of water, for example, the oldest known pottery vessels (Fig. 4-5) come from China and are approx. 18,000 years old. So it was at that point, when man started to transport water, and so this marked the start of the history of water supplies, further the Romans who built aqueducts and the Arabs when they invented the irrigation systems. [1]

[1] Water enjoyment: sustainable quality, technology and design. Grohe AG).

Fig. 4. An Incipient Jōmon pottery vessel reconstructed from fragments (10,000–8,000 BC), Tokyo National Museum, Japan, Source: http://www.wikiwand.com/en/Pottery

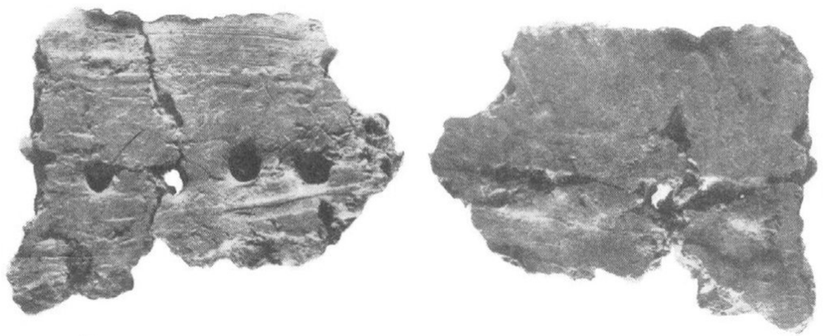


Fig. 5. Fragments of ancient pottery made by mobile foragers dates back little bit more than 20,000 years. Source: Science/AAAS https://www.nytimes.com/2012/07/03/science/oldest-known-pottery-found-in-china.html

Fig 6. Recreation of the urbanist scheme of the city of Babylon. The inner and outer enclosures are differentiated. Ilustración de J.R. Casals. https://www.artstation.com/artwork/wqWmg

Arnold J. Toynbee[1] argued that civilizations are a result of a challenge, which drives growth due to the different environments and approaches that entail them.

The planning of the great cities and ancient civilizations developed alongside large rivers as they ensured survival for people, livestock and cultivation.

Babylon (Fig. 6), was an ancient city of Mesopotamia, they used water courses to provide river defense and transport. For the Egyptians, the annual flooding of the Nile River (Fig. 7) represented the divine order, was fundamental in the birth of this civilization as an inexhaustible source of resources and main way of communication which even marked a symbolic route for the processions of sacred ships and festivals.

The river propitiated the development of agriculture and livestock as a means of the economy of the Egyptian country.

The Nile River, and Mesopotamia are the first organizations where water architecture was successfully developed, allowing the emergence of new territorial structures that are then transformed into cities composed by buildings, public spaces, and gardens as an architectural operation to capture the origin of the natural scenario.

[1] London, 1889- New York 1975) British philosopher and historian, considered one of the most important in history, achieved his fame thanks to his 12 volumes of “A study of history 1934-1961).

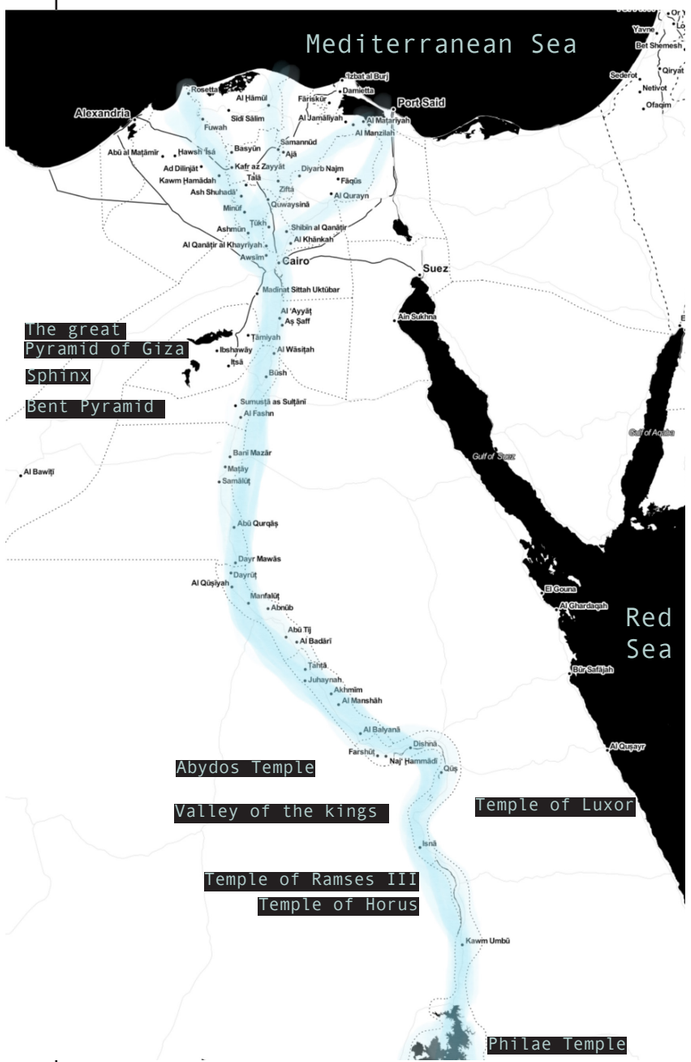


Fig. 7. Ancient Egypt Nile River, Recreated from an image found in: https://es.maps-egypt.com/el-antiguo-egipto-en-el-r%C3%ADo-nilo-mapa

A) Women's pool
B) Shahneshin room
C)Qajar pool house
D) Long pool
E) Library
F) Safavid pavilion
G) Main pool
H) Museum
J) Prayer room
K) Large bathouse
L) Entrance hall
M) Ramparts

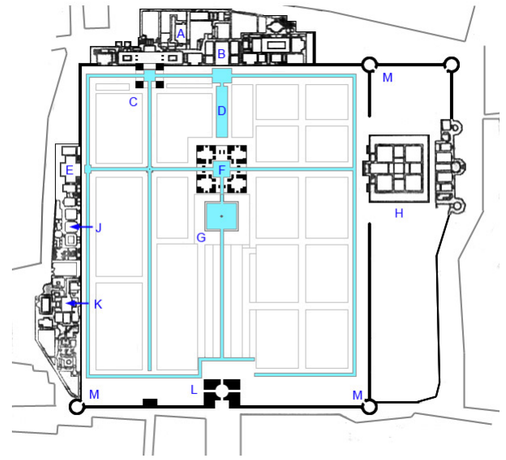
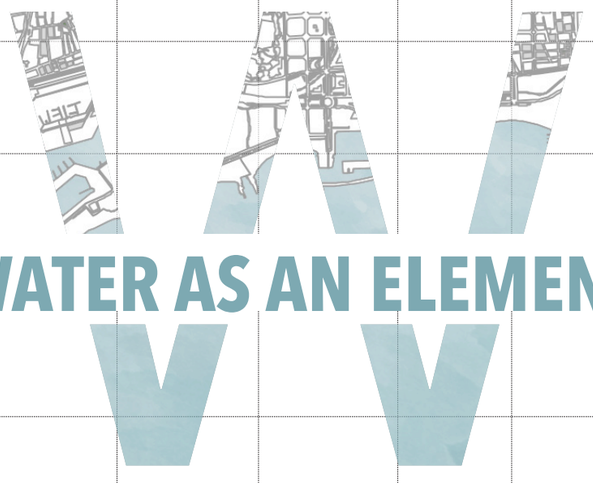


Fig. 8. Fin Garden or Bagh-e Fin, Located in Kashan, Iran (1501-1736) Water as a central element of the space. Recognized as a part of World Heritage by UNESCO. Found in: https://sfiran.com/travel/iran-destinations/story-of-fin-garden-in-kashan-unesco-site

In the Persian culture, the paradise is seen as a place of contemplation, meditation and pleasure in a garden where fountains and springs are part of the space, using water for irrigation, visualization and as a sound effect. (Fig. 8)

Water not only provides a basis for the existence of man and a continuous challenge to ensure its use, but is a source of metaphysical symbolism, aesthetic pleasure and therapeutic value.



WATER AS AN ELEMENT

Watercontext

2. Water as a resource

2.1 Water as an element

2.1.1 Symbolic value

2.1.2 Aesthethic pleasure

2.2 Water as territory

Fig. 9. The Fountain of Youth, 1546, painting by Lucas Cranach the Elder.

Water as an element

Water is the main and essential component of the human body. It constitutes 75% of our body at birth and about 60% in adulthood. Intervenes in almost all the processes that take place in the body.

2.1.1 Symbolic value.

For ancient thought, water was one of the four constituent elements of the cosmic reality: air, water, earth and fire. Water is a main part and vital foundation in all cultures and all religions.

The water cleanses and purifies the body, which gives it a symbolic and even sacred status in some cases, making it a key element in various cults and religious ceremonies. Practically all religions have a use of water in a ritual sense. In Judaism, ritual bathing in the mikveh is an spiritual cleansing action. In Hinduism, water is an indestructible element, it cleanses from sin so the use of this is mandatory every day, along the Ganges the souls of the dead are taken to the “eternal life”.

In the Islamic religion, water has, above all, a purifying function and Allah is frequently compared to an ocean that administers water to all living things.

In the Bible, water appears as the primal element of all creation, so that in the beginning “the spirit fluttered on the waters” (Genesis 1,2) In Christianity, the symbolism is reinforced by the act of baptism.

Fig. 10. Hindus bathing in the Ganges River. Source: https://theancientinstitute.wordpress.com/water-indian-religions/

Fig 11. Dead bodies dipped into the Ganges River to remove sins before cremation. Source: https://theancientinstitute.wordpress.com/water-indian-religions/

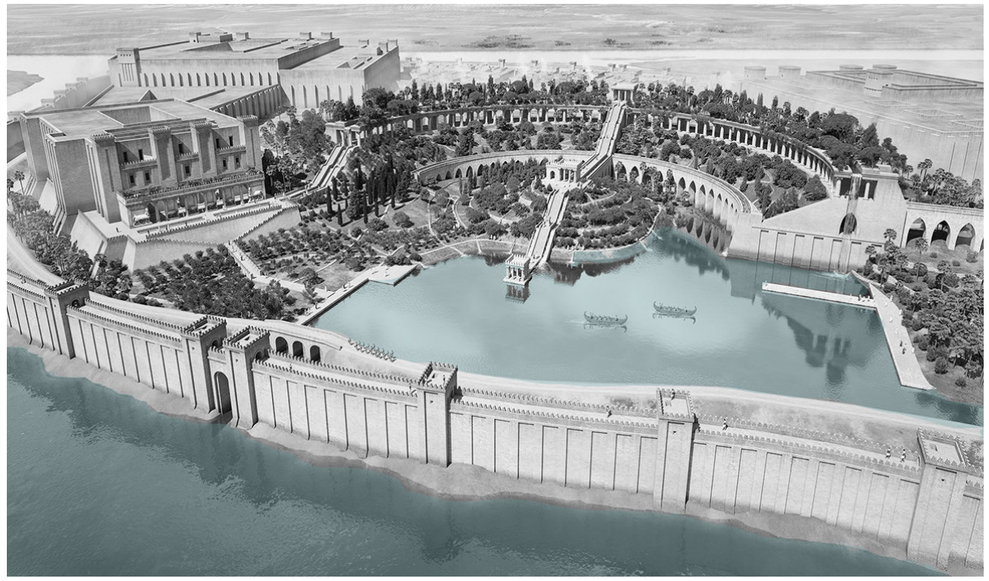


Figure 12. Recreation of the hanging gardens of Nínive. (700 BC) Illustration by J. R. Casals. https://www.artstation.com/artwork/wqWmg

2.1.2 Aesthethic pleasure

If we turn the pages of history, we find that water has been an element used for the aesthetic pleasure of a space, as in the Mesopotamian Gardens (Fig. 12) this suggests that people have been tempted by the values of water all the time from antiquity to our days.

This way of planification and design can be benefit by the integration of the water in the urban spaces where not only an aesthetic order is developed but a social aspect that makes the city more livable and resistant by implement it in early stages , considering the space as a relaxation in the urban tissue/skin.

In squares or parks, water has been brought into play, with waterfalls, tunnels, water mirrors, or sources of all types and scales. Many historical entities consist of water as a vital attraction. For example, Piazza di Trevi (Fig. 13) located in Rome, Italy

One of the most common and vital content in many of world's most famous public places is a water feature. Many cities are based on water as a vital element of attraction. (Fig. 14-19)

Figure 13. Trevi Fountain, Rome, Italy, Photo by David Iliff, 2007, Source: https://commons.wikimedia.org/wiki/Fontana_di_Trevi#/media/File:Trevi_Fountain,_Rome,_Italy_2_-_May_2007.jpg

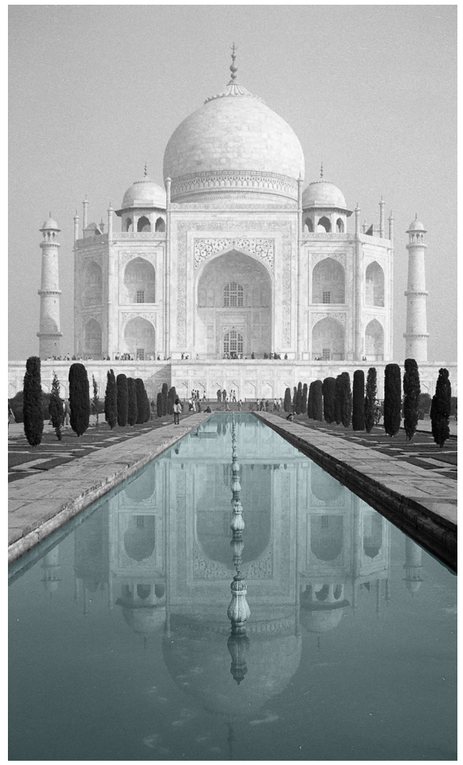


Fig. 14. Taj Mahal Photo by Meutia Chaerani, https://commons.wikimedia.org/w/index.php?curid=2117894

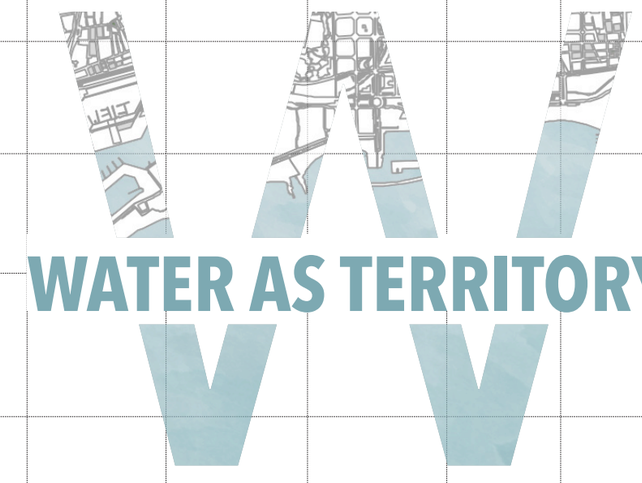
Fig. 15. Versailles gardens, France, Souce: https://commons.wikimedia.org/wiki/File:Vue_à_vol_d'oiseau_des_jardins_de_Versailles.jpg

Figure 16. Reflecting Pool on the National Mall, Washington DC, USA, Photo by the author.

Fig. 17. Venice, Photo by Magdalena Sawicka Source: http://magdalenasawicka.com/project/venice-photography/

Figure 18. Stockholm by boat, Source: http://www.woodyworldpacker.com/sweden-stockholm-in-8-black-white-photos/

Fig.19. Sydney, Australia Photo by Chris Van Kan, 2015, Source: http://chrisvankan.com/portfolio/city-2/sydney.html



Watercontext

2. Water as a resource
2.1 Water as an element
2.1.1 Symbolic value
2.1.2 Aesthethic pleasure
2.2 Water as territory

Fig. 20 Pesse Dugout Canoe 8000 BC Found in Holland, Source: http://museaindrenthe.nl/collectie/object/27368409-69dc-0888-ab8e-252b1d4f5760

Water as territory

"Water is the element that we can least do without, both for life and also to enhance and for our daily use"
-Vitruvius

In light of the fact, since the beginning of the human species, the place to dwell has been firm land, however, through hundreds of miles of years the man has build their homes next to the water, reaching to the coasts to make sure that they could take advantage of the living sources of the ocean, even if they will only exploit it when the tides pushed the resources to the ground.

It was when the navigation techniques developed when the man took full advantages of the assets of the water, giving it a place to explore the maritime transportation of products, trades between different nations wich caused changes in their activities and the economic development.

Fig. 21 Torres Strait islanders on a bamboo raft, 1906-the Encyclopedia of New Zealand, Source: http://www.TeAra.govt.nz/en/photograph/1764/torres-strait-islanders-on-a-bamboo-raft-1906

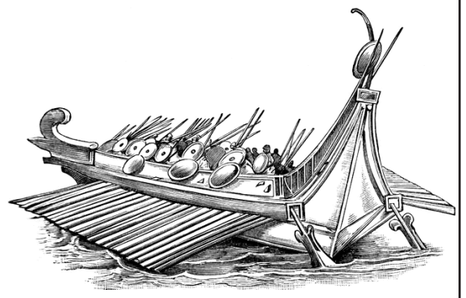


Fig. 22. Roman Ships, Caesar's Gallic War. Boston, USA: Allen And Greenough's, p.83. Source: https://archive.org/details/caesarsgallicwa00caesgoog

Since the beginning, our existence was based in the capacity of movement and adaptability, it is to this that we owe our survival as a specie. The aquatic transportation answer back to the time of prehistory, emerged as a need that the population had because of the fact that they concentrated on the banks of the rivers or on the maritime coasts.

The canoe is thought out to be the first floating structure used by the man to sail in the water (Fig. 20) so as the rafts (Fig. 21). Then the Romans used sailing boats wich were the first transportation media through long distances, for example (Fig. 22)

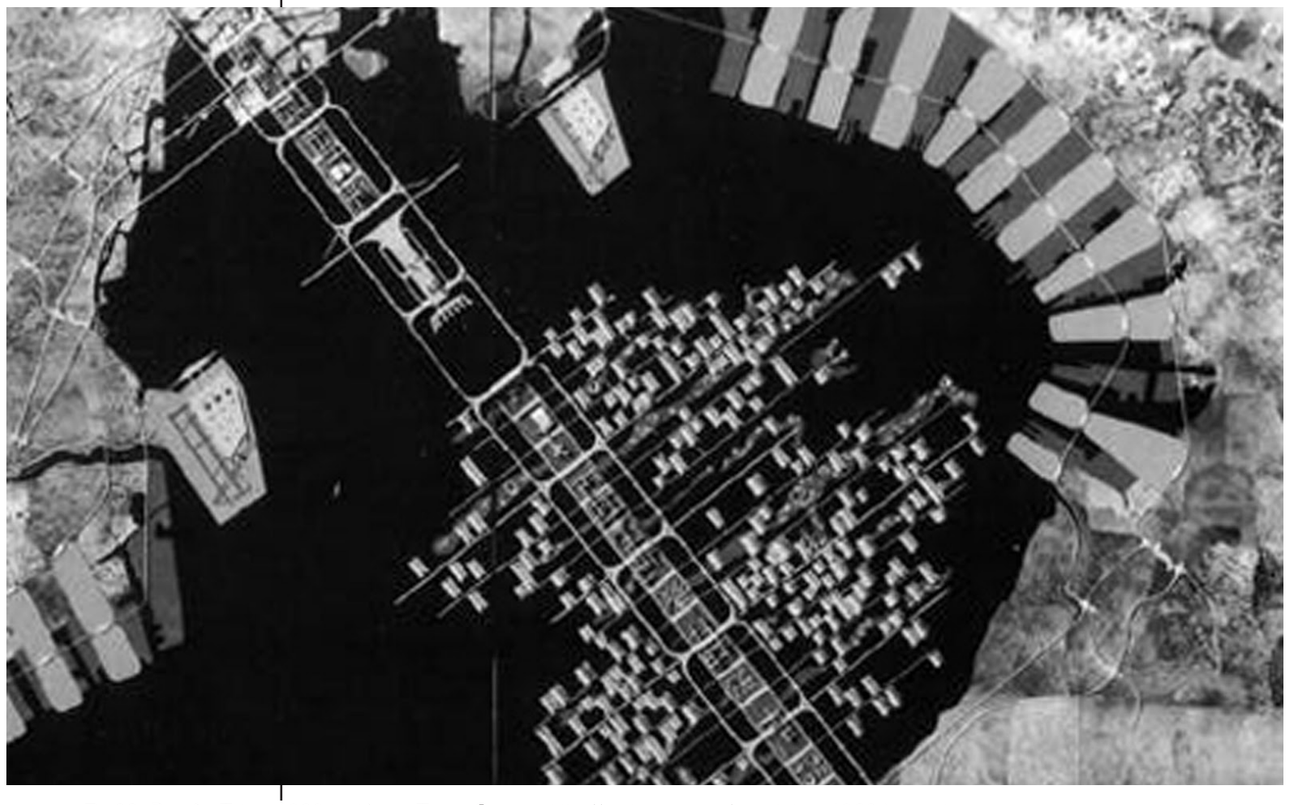


Fig 23. Plan for Tokyo 1960 by Kenzo Tange,Source :http://archeyes.com/plan-tokyo-1960-kenzo-tange

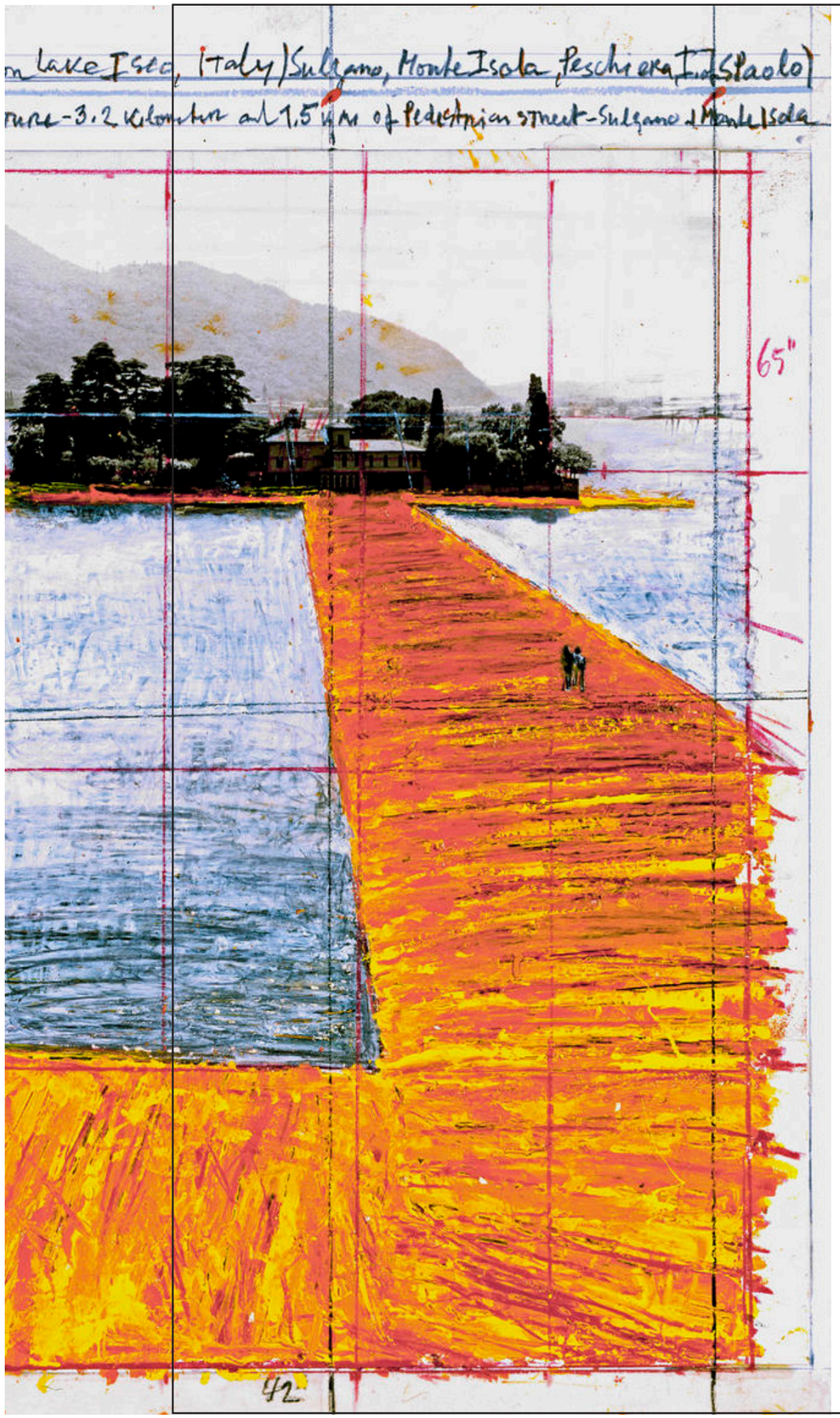
The human population of the planet has been studied by a large number of authors, leading to the conclusion that a community that is located at a distance of 50 kilometers from the coast its still considered that directly coastal population because all of its industrial activities are linked to the sea.

Population in the coastal zone has increased considerably at the beginning of this century, it is estimated that in 2050, 70% of the world population will live in urbanized areas. The largest cities are located across the water. In Spain, according to a study elaborated by the National Institute of Stadistics, the coastal provinces keep growing, in 2009, 15 millions of Spanish lived in the coast wich equals the 32,7% of the population living in the litoral area.

In the North-western region of Europe, the Elbe, Weser, Thames and Rhine rivers have allowed the establishment of large cities as Liverpool, Paris and Hamburg wich are some of the cities that have the largest population in Europe, their support depends mostly in the marine activities like fishing, commerce, tourism and transportation, even electricity production from the tides have been used.

In some places, the overpopulation is taken into account. Netherlands has been working in creating and conquest the coastal lands as a response, and in Japan they have landfilled waterways to earn more land as in the Tokio Bay, site that has had a list of projects to extend the land on the water, in 1960 Kenzo Tange produced a radical proposal to overcome the chronic shortage of existing soil in the metropolis. (Fig. 23)

03



3.1 Floating Piers

Location: Lake Iseo, Lombardy, Italy.

Year: 2014-2016

Dimension: 3 Kilometers long.

Architects: Christo and Jeanne-Claude

Analysis:

A floating dock that extends over the water of Lake Iseo and that takes by name The Floating Piers.

The work consists of a walkway 3 kilometers long with floating springs system composed of 220,000 cubes of high density polyethylene.

The yellow path continues as an extension of the peatonal street of Sulzano city, and connects with San Paolo and Monte Isola islands.

“Those who experienced The Floating Piers felt like they were walking on water – or perhaps the back of a whale,” said Christo. “The light and water transformed the bright yellow fabric to shades of red and gold throughout the sixteen days.

Fig. 24. Collage 2014 of floating piers, Photo: André Grossmann Design by: 2014 Christo, Source: http://www.christojeanneclaude.net/projects/the-floating-piers

3.2 Floating School

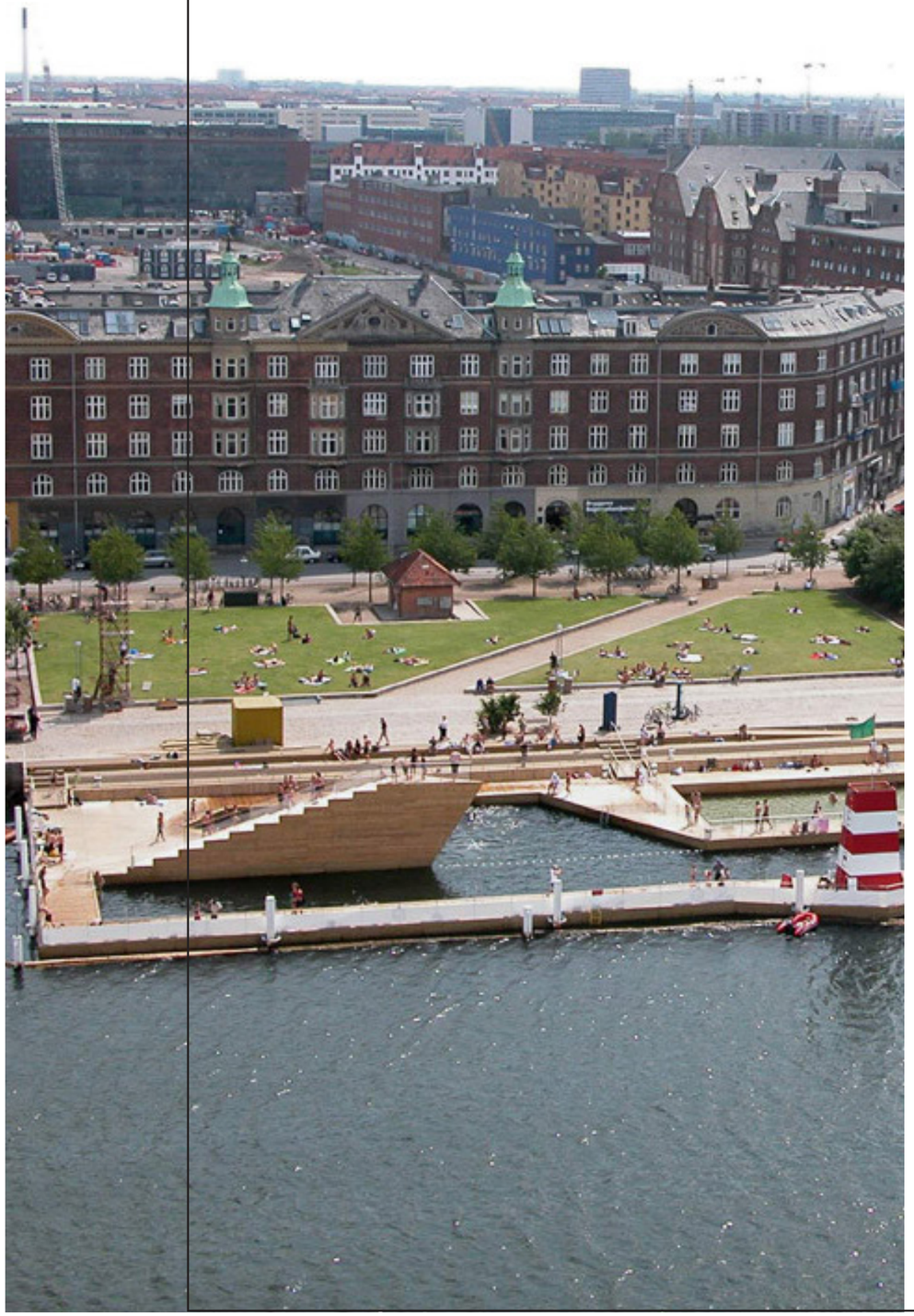
Location: Lagos, Nigeria

Year: 2013

Architects: NLE Architects

Analysis:
The use of local materials to respond to the need of the culture of the community, woos is the main material as the structure. The floating structure is composed by barrels with a wooden frame that holds them in place. The composition of the building is based on an A-frame section. The classrooms are located in the second story, and in the ground level a wide open space.

Fig. 25. Makoko floating school, Source: https://www.20minutos.es/fotos/cultura/arquitectura-rapida-para-las-catastrofes-11892/4/



3.3 Winter bath harbour in Copenhagen

Location: Copenhagen, Denmark

Year: 2003

Dimension: 2500.02 m2

Architects: PLOT = BIG + JDS

Analysis:

The project is part of a transformation of a industrial port, creating cultural and social centre for the city. Lanscaped harbor composed with dry-docks, piers, boat rams, pontoons and playgrounds, the space is terraced making a transition from land to the water to allow the possibilities of swimming.

Fig. 26. Copenhagen Harbour Bath, Source: https://www.archdaily.com/11216/copenhagen-harbour-bath-plot

3.4 Antiroom pavilion.

Location: Valletta, Malta.

Year: 2015

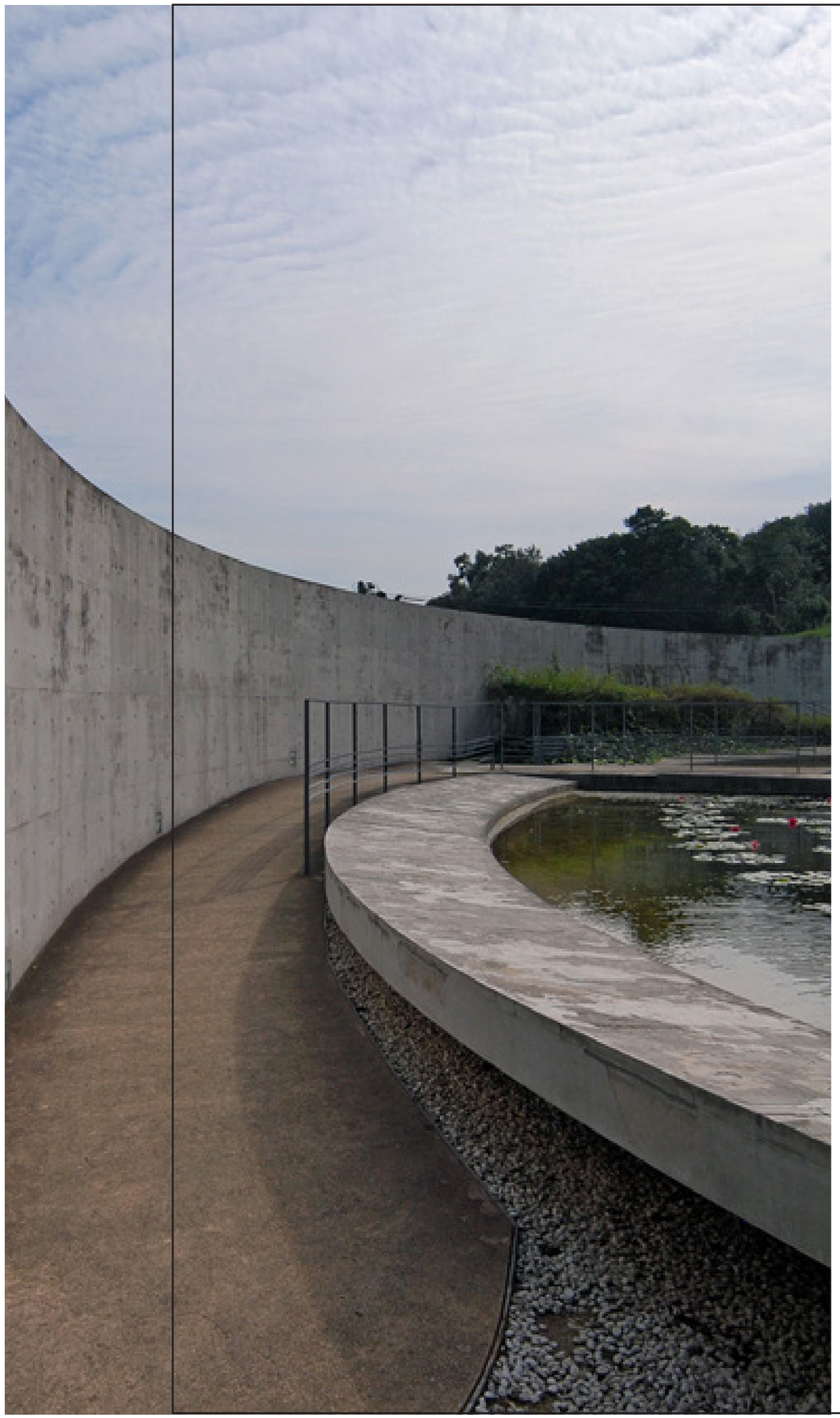
Architects: Elena Chiavi, Ahmad El Mad, Matteo Goldoni

Analysis:

Wooden pavilion created in Malta, it can only be reach by a boat or swimming, made with timber and curtains for the walls. Antiroom has a circular structure form, creating a secure water pool in the center of it.

The circle can be separated by parts due to its modular composition of assembly.

Fig. 27. Antiroom, photos by Ahmad El Mad, Source: https://inhabitat.com/antiroom-ii-is-a-circular-wooden-meditation-space-floating-off-the-coast-of-malta/



3.5 Water Temple

Location: Tsuna, Japan.

Year: 1990-1991

Dimension:

Architects: Tadao Ando

Analysis:

This project is used as an analysis of the implementation of water in a space where sensory and religious experience is essential. The temple of Water, belongs to the Buddhist religion.

The geometry of the Temple of Water is developed with a language that manages to convey a deep spirituality that reaches the landscape located in a topography of hills, with an oval that symbolizes the eternal, along with four lines, two of which open the entrance towards the interior of the temple incrustándose in the water tank, and the others limit the outer / inner space.

Fig. 28. Water temple entry, Source: https://www.archiweb.cz/en/b/vodni-chram-shingonshu-honpukuji

3.6 Floating Islands

Location: Seoul, South Korea

Year: 2011

Dimension: 9,995m2

Architects: Haeahn Architecture & H Architecture.

Analysis:

Project part of a scheme to stimulate the water landscape in Seoul, where the Han River divides the city in half.

Cultural, educational, recreational is some of the typologies that are held in the floating islands, The concept emerge of a blooming flower. Pontoon system is utilized to permit the floating along with a mooring system consideren environmental factors from wind to water level fluctuations. Most of the structure required prefabricating then launching them in the river and assembly them on site.

Fig. 29. Seoul Floating Islands / Haeahn Architecture & H Architecture, ArchDaily. Source: https://www.archdaily.com/252931/seoul-floating-islands-haeahn-architecture-h-architecture/

3.7 Floating Houses

Location: Amsterdam, The Netherlands

Year: 2011

Dimension: 10,652m2

Architects: Architectenbureau Marlies Rohmer

Analysis:

Located in a district of Amsterdam, floating dwellings have been built to give a response to the need of land, it consist on seventy five floating homes in a private sector. The floating homes are supported by buoyant concrete tubs submerged in the water to a depth of half a story. A lightweight supporting steel construction is built on top, which is fitted with wooden panelling to make rooms and floors.

Fig. 30. Floating Houses, Photo by Marcel Van der Burg, Source: https://www.archdaily.com/120238/floating-houses-in-ijburg-architectenbureau-marlies-rohmer/5013ba7f28ba0d3963000c53-floating-houses-in-ijburg-architectenbureau-marlies-rohmer-photo

3.8 Floating plaza for Florida.

Location: West palm beach Currie park.

Architects: Carlo Rotti

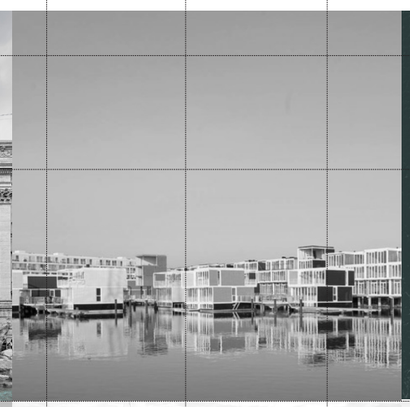
Analysis:

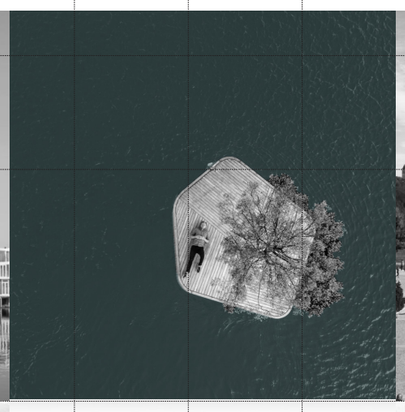
Buoyant public space is a proposal by Carlo Rotti Association using submarine technologies to design a public space off the coast.

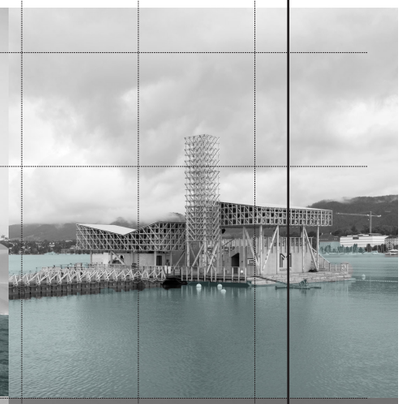
The plaza will be partly submerged, including seatings, performance space and walkways.

Fig. 30. Floating Plaza, Source: https://www.dezeen.com/2016/11/01/currie-park-floating-plaza-public-space-architecture-news-carlo-ratti-associati-west-palm-beach-florida-usa/

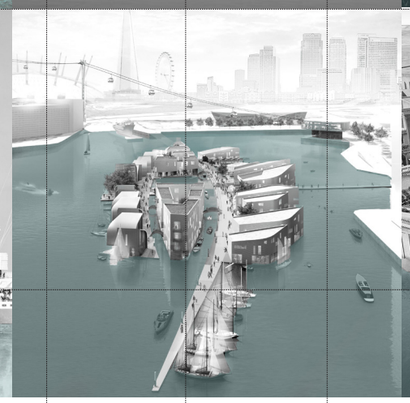
04

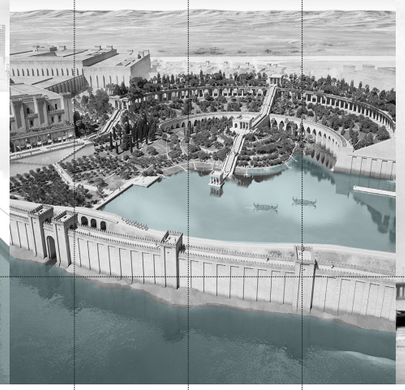


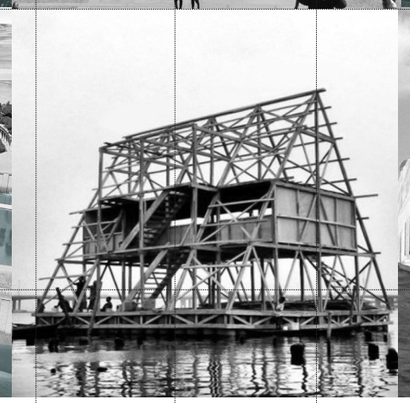


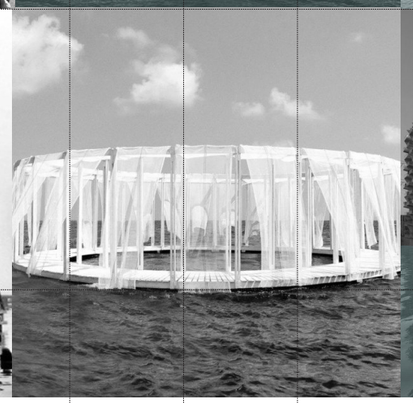


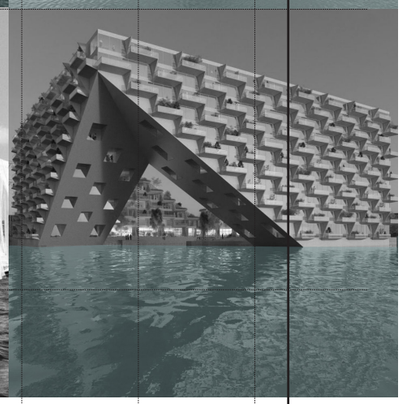

URBAN RIGGER











Floating Architecture

In this chapter, the countries that have shown great interest in floating architecture that deploy the concept of mobility in order to adapt to the environments are investigated according to the factors that affect the environment such as those mentioned above, dynamic society, overpopulation and climate changes.

The floating homes constitute an alternative of trascendental interest. Countries like Australia, Canada, Hong Kong, Netherlands, New Zealand, United Stated, United Kingdom and Venezuela strive every day to implement the occupation of the waterfront with this type of structures. Its indicated that the growing interest in occupying water is due to several reasons, among wich are the continuous increase in water levels due to the global warming.

In the Netherlands where more than half of the country is below sea level has led the government to rethink and invest in dams so they will no longer be a potentially flooded area.

Fig. 31. House-boat, Netherlands. Source: www.houseboatmuseum.nlinfo@houseboatmuseum.nl

Fig. 32. House vessel, Netherlands. Source: www.houseboatmuseum.nlinfo@houseboatmuseum.nl

Fig. 33. Amsterdam, Netherlands House-boats, Photo by Kaci Baum, Source: https://commons.wikimedia.org/wiki/File:Amsterdam_Canal_Houses_(Unsplash).jpg

Fig 34. Amsterdam channel, Photo by Merijn Robroeks, Source: https://www.iamsterdam.com/es/planifique-su-viaje/alojamiento/casas-barco

Housing solutions were needed after the Second World War due to the lack of housing, the outhouses emerged as a spontaneous answer, currently 2,400 families live afloat in the canals of Amsterdam (Fig. 33-34). Two types of floating homes are predominant in the different channels of the city, the house-boat, characterized by reusing old cargo ships mainly made of metal or iron (Fig. 31), and the house-vessel wich also reuses an old ship but the original deck is eliminated to accommodate a new structure with the intention of inhabiting it. (Fig. 32)

Fig. 35. National Assembly Building in Dhaka, Bangladesh, Louis Kahn, 1962–83. Photo by Raymond Meier. https://www.yatzer.com/even-brick-wants-be-something-louis-kahn/slideshow/9

Fig. 36. Bodiam Castle, Photo by Antony McCallum, 2008, Source: https://commons.wikimedia.org/wiki/File:Bodiam-castle-10My8-1197.jpg

Fig. 37. Opera House, Photo by George Rex, Source: https://www.flickr.com/photos/rogersg/14573797915

Fig. 38. Blur building by Diller Scofidio. Photo by Norbert Aepli, Source: https://commons.wikimedia.org/wiki/File:20020717_Expo_Yverdon_23.JPG

Fig. 39. Uros in the Lake Titicaca, Photo by Bgabel, Source: https://commons.wikimedia.org/wiki/File:Uros_titicaca_2.jpg

4.1 Developments of floating architecture.

Floating architecture includes built, buoyant structures sited on bodies of water, and showcases a range of innovative projects, diverse materials and unconventional forms. [1]

In South America, The Uros, pre-Incan living between Bolivia and Peru in the Titicaca Lake (Fig. 39), consider themselves as the owners of the lake and water, they have lived in a self construct floating island (Fig. 42) for approximately 120 years. They originally created their islands, many centuries ago, to prevent attacks by their more aggressive neighbors, the Incas and the Collas. [2]

Islets are made of totora reeds, which grow in the lake. The dense roots that the plants develop and interweave form a natural layer called Khili (about one to two meters thick) that support the islands. They are anchored with ropes attached to sticks driven into the bottom of the lake. The reeds of the island are added at the top constantly, about every three months. The islands last about thirty years. The rafts are anchored with ropes attached to sticks driven into the bottom of the lake. (Fig. 41)

[1] National Geographic, The Uros, Floating village of Lake Titicaca http://www.ngenespanol.com/traveler/lugares/15/11/11/Los-Uros-el-pueblo-flotante-del-Lago-Titicaca/. 03/20/2018

[2] Designboom. Floating Architecture. https://www.designboom.com/tag/floating-architecture-and-artificial-islands/ 10 junio 2018.

Fig. 40. Reed boats, Photo by Werner Forman Archive, Source: http://www.ngenespanol.com/traveler/lugares/15/11/11/Los-Uros-el-pueblo-flotante-del-Lago-Titicaca/

Fig. 41. floating island, Photo by Werner Forman Archive, Source: http://www.ngenespanol.com/traveler/lugares/15/11/11/Los-Uros-el-pueblo-flotante-del-Lago-Titicaca/

Fig. 42 Uros, Photo by Christian Haugen, Source: https://www.flickr.com/photos/christianhaugen/3657224580

Fig. 43 Platform Gail, Sockeye Offshore Oil Field, near Santa Barbara, Southern California, Photo by employee of the U.S. government Source: https://commons.wikimedia.org/wiki/File:PlatformHolly.jpg

The main reason why human beings have decided to intervene on the coasts has always been to find a new way of living, a new home, since ancient civilizations this type of housing has created a stir in the exploration of the methods that can be implemented to inhabit the water.

Apart from the residence floating structures, there has been other typologies in wich the floating technique has been applied. (Fig. 45-50)

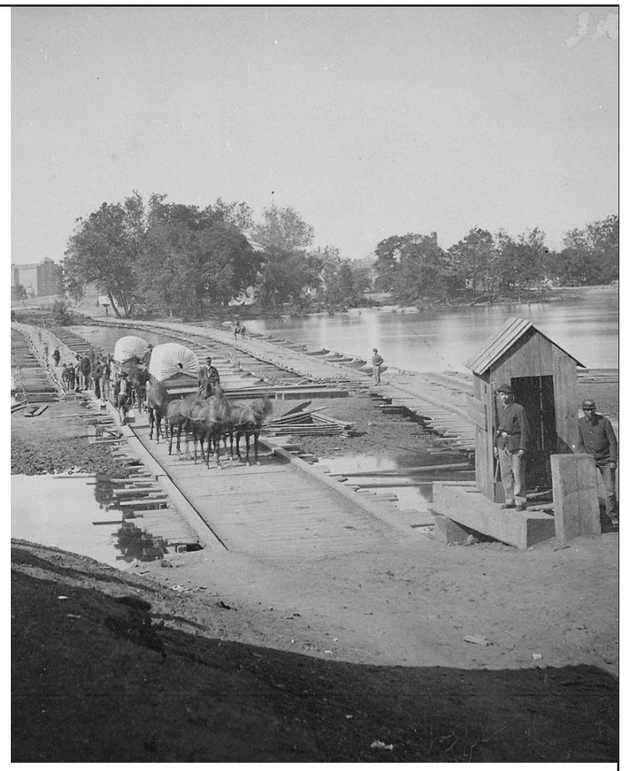


Fig 44. Pontoon bridge across the James River at Richmond, Virginia, 1865, Source: https://commons.wikimedia.org/wiki/File:Pontoon_bridge_across_the_James_River_at_Richmond,_Virginia,_1865_-_NARA_-_533119.jpg

For example, floating drilling platforms are being used since the 1970's (Fig. 43), largest megastructures offshore, and also, floating bridges were usually temporary structures used by pedestrians or vehicles, used in wartime and were mostly destroyed after crossing. (Fig. 44)

Nowadays, the floating architecture extends to a lot of typologies spreading the land to the water as the main objective, exploring the flexibility.

The types majorly implied can be floating structures that are stationary, floating, mobile.

Figure 45. Reflecting Pool on the National Mall, Washington DC, USA, Photo by the author.

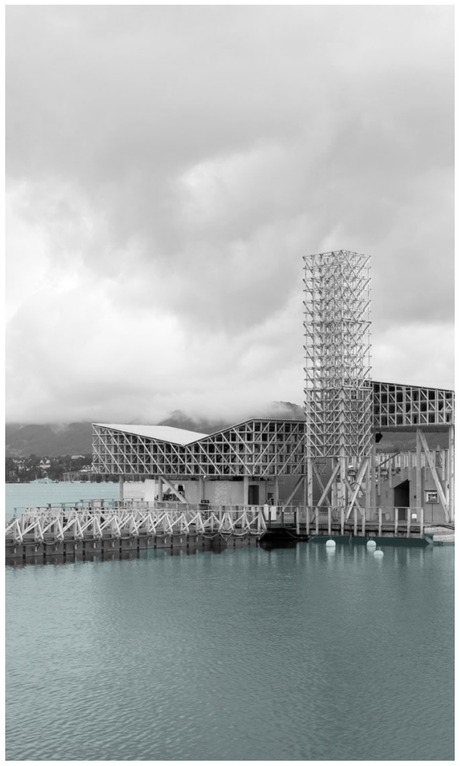


Fig. 46. Venice, Photo by Magdalena Sawicka Source: http://magdalenasawicka.com/project/venice-photography/

Figure 47. Stockholm by boat, Source: http://www.woodyworldpacker.com/sweden-stockholm-in-8-black-white-photos/

Fig. 48. Floating settlements, design by Baca architects, Source: https://www.dezeen.com/2017/06/09/video-baca-architects-floating-architecture-homes-movie/

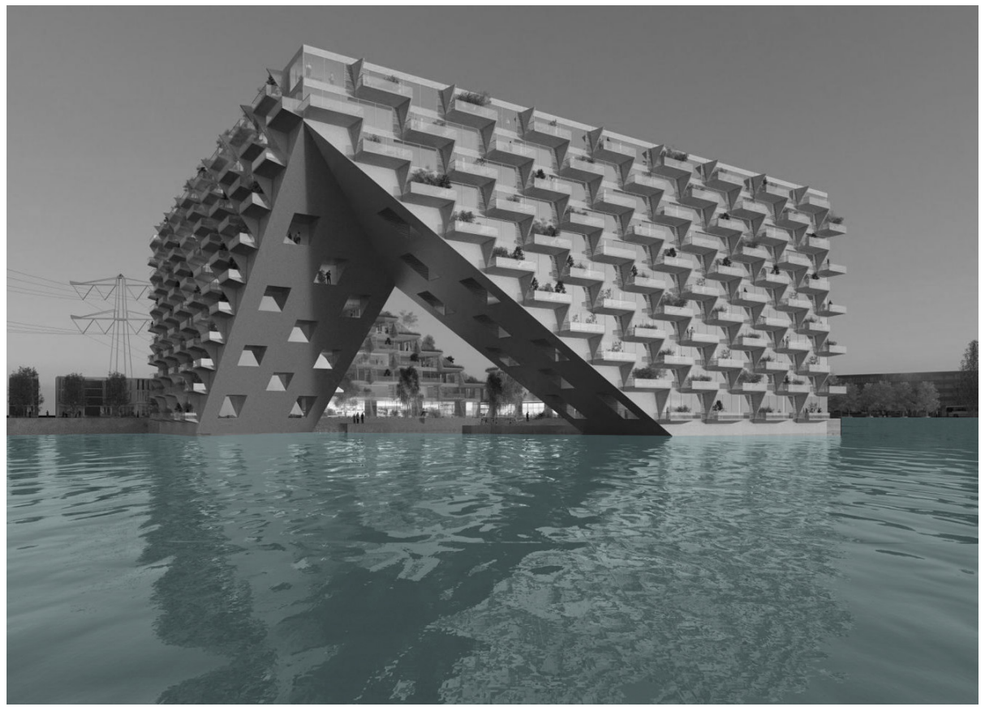


Fig.49. Sydney, Australia Photo by Chris Van Kan, 2015, Source: http://chrisvankan.com/portfolio/city-2/sydney.html

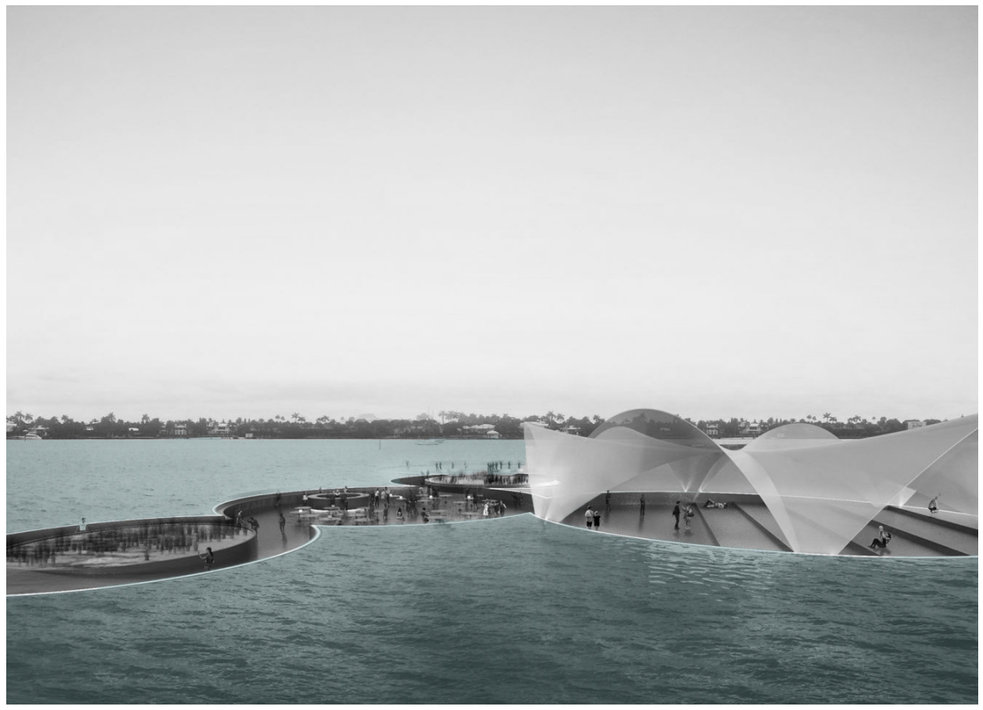


Fig.50. Sydney, Australia Photo by Chris Van Kan, 2015, Source: http://chrisvankan.com/portfolio/city-2/sydney.html

4.2 Climate change and overpopulation.

Climate change poses a serious question: how will our cities cope with rising sea levels? Some architects believe that floating buildings oFer the answer, and have come up with a wide variety of designs to prove it, from simple prefab homes to entirely amphibious neighborhoods.

Whenever disaster strikes, the buildings invariably burn, flood or collapse, we can prove this type of cases through the varying years.

Architects have turn to searching for solutions and getting answers. When it comes to flooding, instead of reinforcing protection the reality of sea level rise is being incorporated into the designs that are located in vulnerable areas. This type of decisions have been raising awareness of global catastrophic risks that can fix adjustments that were made when climate change was not an issue.

According to the statistics, today's world finds itself in the middle of increasing global warming. It has become one of the most complicated modern-time issues to deal with. Global warming is defined as the increase of the average temperature on Earth. Both ocean and land temperature have risen, on global average 0.8C since the 1970s. While global warming is the cause, climate change is the effect.

Almost all regions of the planet are affected. Floods, drafts, hurricanes, tsunamis, heat waves and freezing periods with unusually low temperature all these forces of nature happening around the globe are widely and frequently reported by media. Both the thermal expansion of sea water and the melting of ice contribute similar shares to sea level rise, although the melting polar ice sheets considered as a main contributor.

Many countries in the world are already taking climate change seriously, and consider planned adaptation as a good precaution against upcoming consequences of climate change. As an example of such consideration are the coastal defence plans of the Netherlands, where the rising sea level is seen as a major problem.

The waterfront has become an

important issue and important location for developing new architectural projects, enveloping residential, industrial, recreational purposes. “Building on water” as it is called today, develops important relationship with water and became increasingly dominating factor in different urban metropolitan projects.Accepting the challenges of that global warming requires overcoming inertia and developing successful and daring schemes in response to growing environmental needs.

Holland is probably to be the first floating country, in which the notion of housing is transforming into amphibious homes. Floating structures are already part of country’s urban planning.

Floating architecture could help to deal with major problems facing the world such as rising seas, growing urbanization and planet’s overpopulation. It is estimated that by the year 2050 the number of the earth’s citizens is to reach 9 billion, and more housing will be in great demand.

Projects will not necessarily remain static, as some of the products can be placed on water. They can then be relocated and reused in other locations.

We need to look at cities through different eyes. by sharing space, making space more dynamic and using temporary spaces and functions, we could reduce the need for additional buildings. Instead of building more, efficiency and density need to be raised.

Once we can break through the regulatory obstacles, we can unlock new territory, improve efficiency and create new flexible developments.

According to United Nations, it is predicted that two-thirds of the world population will be living in urban areas by 2050. The importance of city regions will therefore continue to grow. Cities provide large efficiency benefits, which result in unprecedented gains in productivity and competitiveness. Cities are the centers of knowledge, innovation and specialization of production and services.

4.3 Types of floating structures.

Ocean space colonization is one way in which engineers, architects, and urban planners have been engaging with the challenge of providing more space and energy resources for people and to confront the climate change factors.

A floating structure is a construction conceived to function as a floating foundation of light or heavy constructions. Depending on the case these can be modular or large structures of a single body.

Two types of floating structures are broadly classified as pontoons or semi-submersibles.

Pontoons: floating slabs that are characterized by their low depth-to-width ratios, is mostly deployed in a sea state condition like water adjacent to the coasts, inside a cove or lagoon, or where a breakwater installation is located in order to protect the structure from large waves. It is consider as generally cost effective with low manufacturing costs, easy to repair or even maintain.

The pontoons are anchored to the sea bed through the use of morning lines (chains, ropes, anchors, tethers or sinkers).

Semi-submersibles is the type of structure that is commonly use in deep sea level, as the deployment of oil drilling platforms since the 1970's. The structural form is thicker than the pontoon counterparts, they are partly raised above the sea level using column tubes or watertight as structural compartments. When deployed to the required location, these floating structures are then attached to the seabed using mooring cables or tethers.

The pontoons are being highly developed in different materials according to the use in different scales .

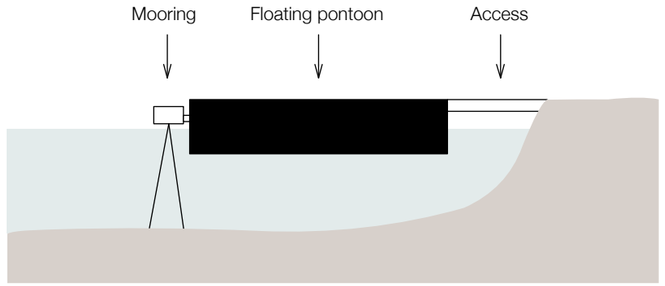


Fig. 51. A pontoon VLFS with associated components, recreated from: Large Floating Structures ISBN 978-981-287-136-7.

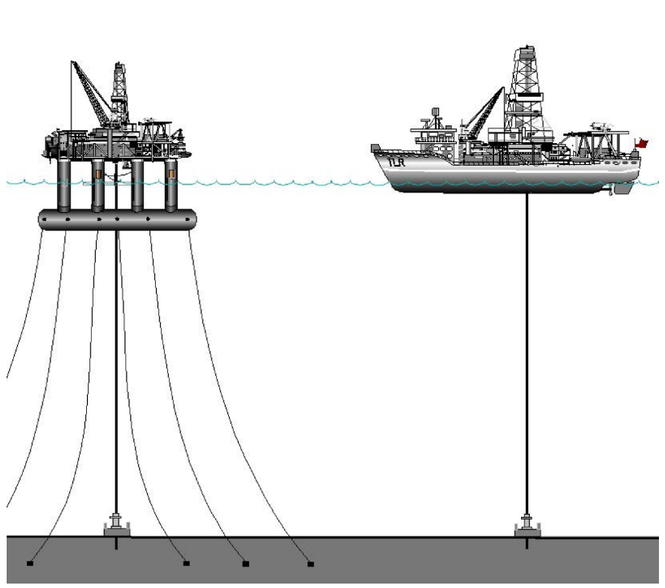
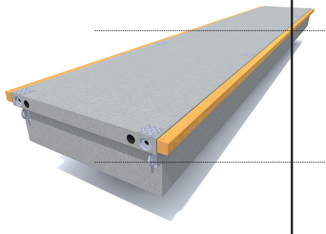


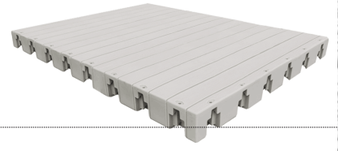
Fig. 52. Deepwater semi-submersible and drillship platforms, Source: https://en.wikipedia.org/wiki/Semi-submersible_platform#/media/File:Deepwater_drilling_systems_2.png

4.4 Types of pontoons

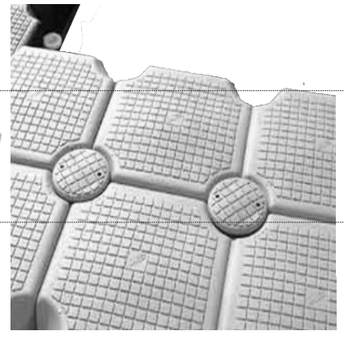
Concrete Pontoon



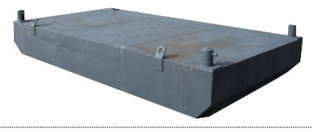
Polyethylene pontoon



Polyethylene Modular Cubes

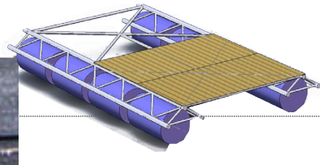


Steel Pontoon

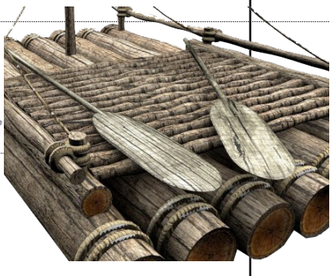


Vulcanized rubber

Pontoon with metal deck and water barels



Rafts with wood



4.5 Advantages of floating structures.

Rapid deployment and ease of construction:

As most of this type of structures are modular, the elements that compound it, are created off-site so the fabrication can be simultaneous. The reclamation works in an in-land project require a consolidation of 2-5 years in order, but with floating structures the space can be occupied right away. The one kilometer long mega-float in the Tokyo Bay only took four months to be constructed. [X]

Flexibility in deployment:

Floating structures can be reassembled or relocated if its required or desired in a new place. Where necessary, the floating facilities can me removed if its no longer needed, it can be towed to other place or even expanded and grouped to other structures as needed. The mobility and flexibility is one of the superior affords supported by this structures.

Suitable for deep water or soft bed sea conditions:

In contrast, floating structures require much less foundation work, depending on a mooring system for anchorage.

Relationship to water surface:

The mooring system allows a vertical movement to be free according to the changing sea level and to cater different payloads. The floating structure surface remains a constant distance from the water surface wich is why in many of the piers, docks, or marina where the berthing of boats and ships can be problematic in large tidal variations

Safer for flooding and hurricanes:

As its buoyant it rises with the level of the water, and as it is base isolated it grants higher measure of safety, due that the floating structures are protected from seismic shocks as they are inherently base isolated. K-Cat terminal in Kobe in 1995 with a 7.2 earthquake in Richter scale suffered no damage. This structures are useful as emergency bases after earthquake conditions.

Conclusion

The Fishermans wanted to live next to the water in order to live close to the activity that they developed, the Uros have lived in the Lake Titicaca because of their safety, In London, people choose to live in houseboats mostly out of economic motives.

Today, theres other reasons that have emerged to make the waterways a viable place to inhabit.
Living on the water has the qualities of inhabiting an attractive, quite and calm environment, some studies have proven that living in a building wich have views towards the water or is in the coast area is 40% expensier compared to homes without it. (Richtlijn levende Steden report)

Climate change is a frequent topic brought to the table to discuss how can architecture work with this changes due to the sea level rise wich is the result of climate changing that brings big risks to the population living in the coastal areas. Many people are living in low lying areas, it is predicted that 50% of the world population lives within 100km of the coast.

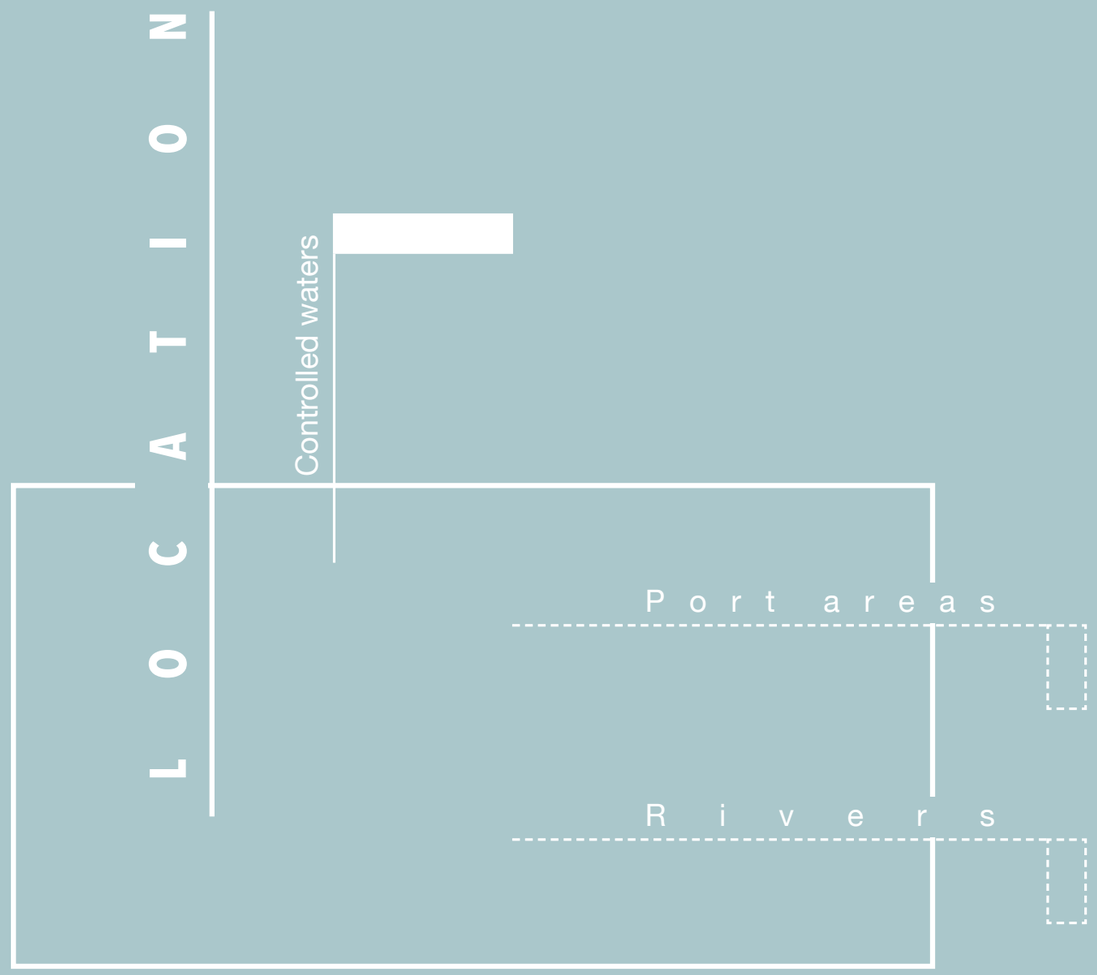
As made clear in previous paragraphs, climate change, sea level rise, urbanization together results in creating multiple space in wich the flexibility that the floating architecture provides is taking as a principle advantage

Limitations:

-People are more afraid of inhabitant in the water because of the fear of tilt or technical issues that put their lives in danger.

-The legislation of building on the water is unclear.

05



The location is proposed in controlled water areas such as ports or rivers, where the incidence of the tides does not turn out to be a problem that affects the functional development of the project.

In Fig. X. some of the most used ports are shown in order to visualize the diverse immediate environment where the project could be located.

The design becomes a place to try the experience of a new point of view towards the city, from the water, which is now a non-place that was once the only one.

Barcelona, Spain

Rotterdam, Netherlands

Santo Domingo,
Dominican Republic

Tokyo, Japan

Singapore, Singapore

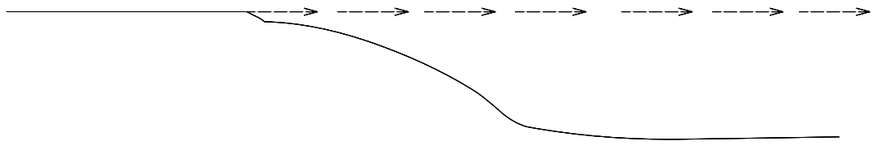
Fig. X. Images from Google Earth, Edited by author

The architecture will be understood as a boat, it will have the ability to be towed to other sites.

DESIGN PROCESS

Intentions

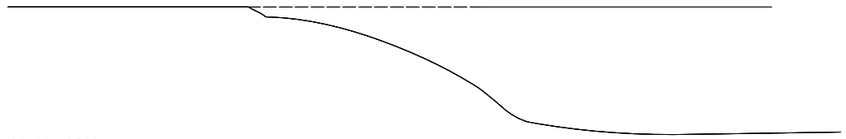
1



CONNECTIONS

Extend the coast line to bring land to the water

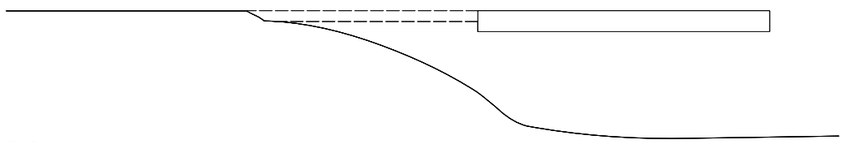
2



ADAPTION

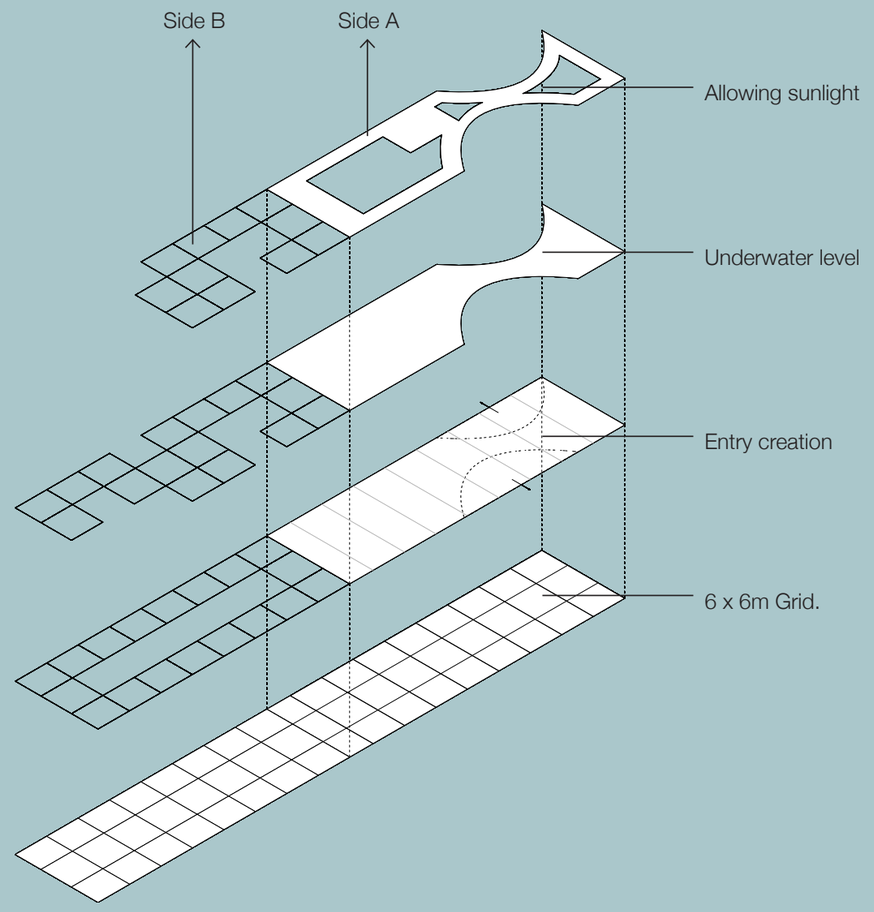
Extend the coast line to bring land to the water

3



FLOW

Creation of a platform as extension to the land



DEFINITION OF THE PROJECT

The design is based on a grid with full and voids, the full spaces are composed of a fixed structure built with the ability to navigate by towing it to other areas where it is needed to develop activities for collective public uses. The same, works as a support to a modular system where the different typologies will be installed into a continuous flexible structural grid, which provides the possible scenarios that the inhabitants are able to create.

The platforms are designed and can be changed according to the activities that will be developed, achieving with the composition of the two sections (Fixed and modular) multi-sensory spaces at different levels of the sea.

It seeks to implement flexibility, modulation and a changing use. In order to keep the story going, a system that supports the ongoing integration of land and water is proposed.

The project is developed to the point of zoning based on general zones and circulation centers. As for the functional enlargement, it will be necessary to employ to other disciplines in order to have the technology applied in fields as submarines structures, to propose the use of them in the development of the project in a general way of analysis.

MULTI-LEVEL RELATION WITH WATER

The project is inspired by the dynamic society and how we can respond with an architecture that adapts to the liquid era, to explore water as a media of flexibility.

The formal intentions of the project are based on creating an interaction between water and the human being where we have always belonged. Spatial intentions concentrate on experiencing the physical space in, on and under the water.

OBJECTIVES

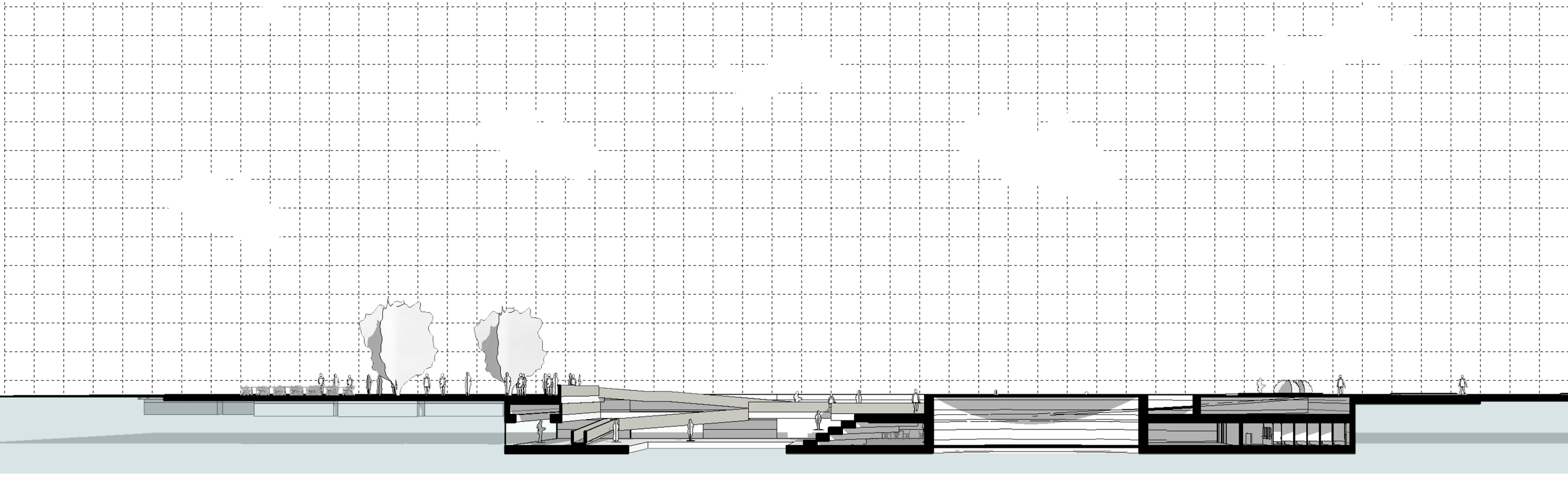
-Urban canvas that registers the lives, dreams, and aspirations of current and future environments.

-Participate in a changing context process with the implementation of new infrastructures.

-Creating new public spaces that enhance the pedestrian connectivity along the river and its playful activity

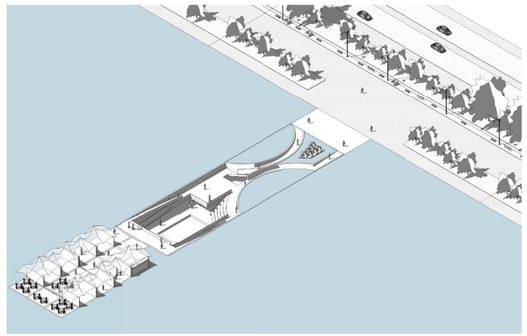
- Create a balanced future environment for people between new technologies and nature.

-Encourage the importance of the development, management and control of water resources oriented to both the climate and its effects on the land, as well as the architectural response to these effects

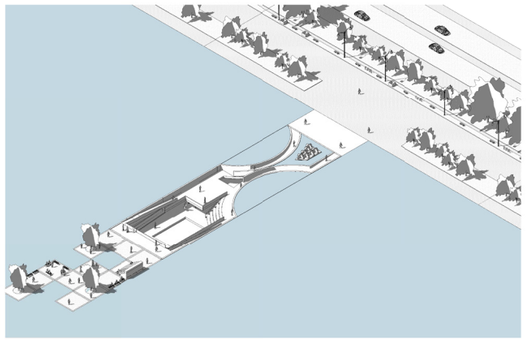


Sectioned Perspective

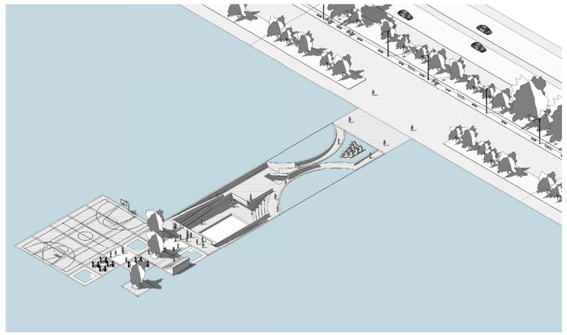
PROGRAM



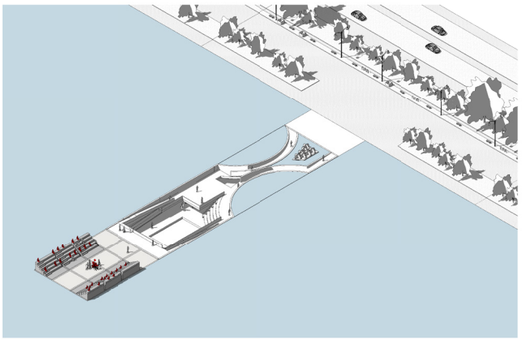
Market.



Park.



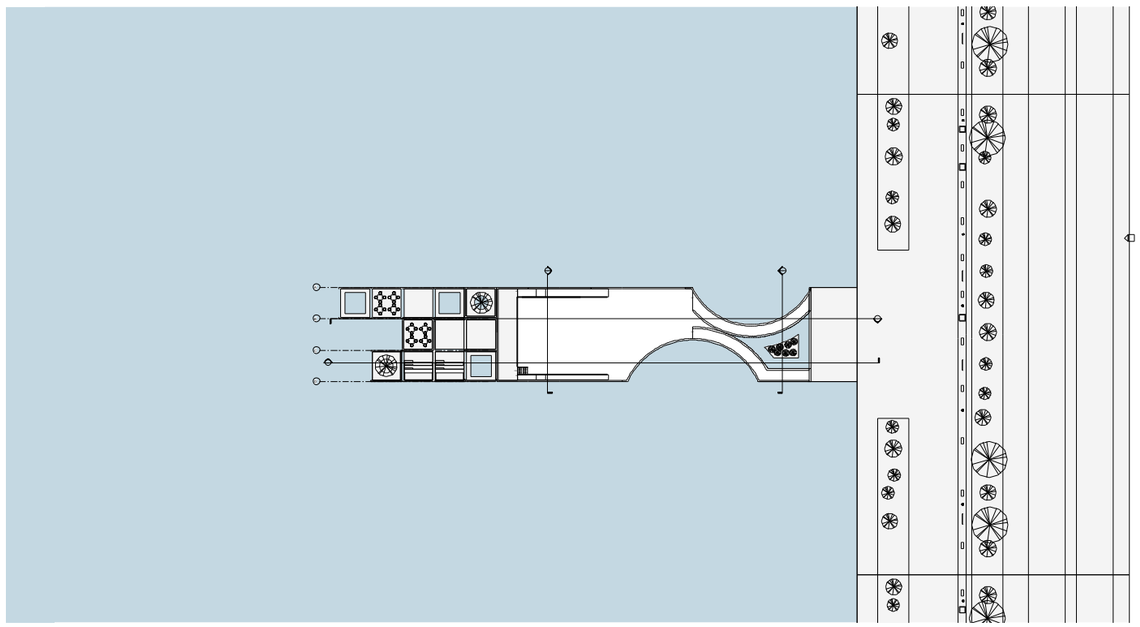
Sports.



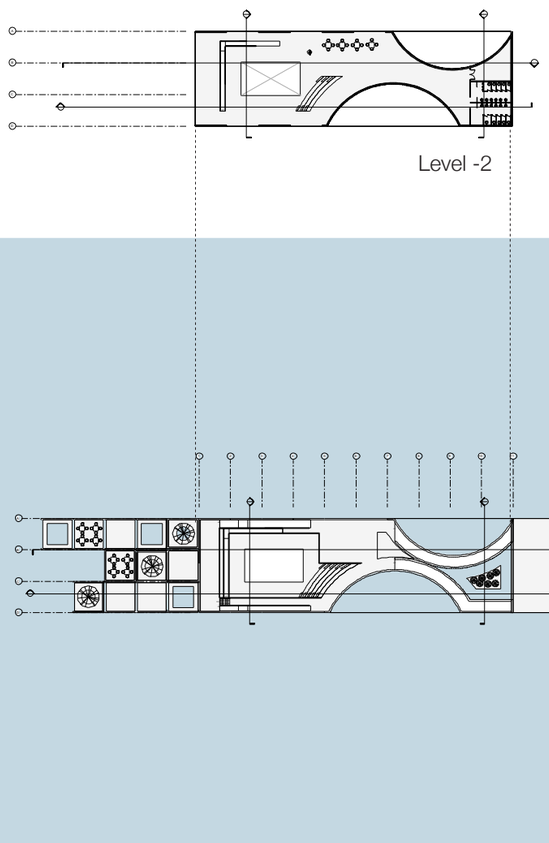
Stage

With the modular platforms the use of the space can change according to collective public uses.

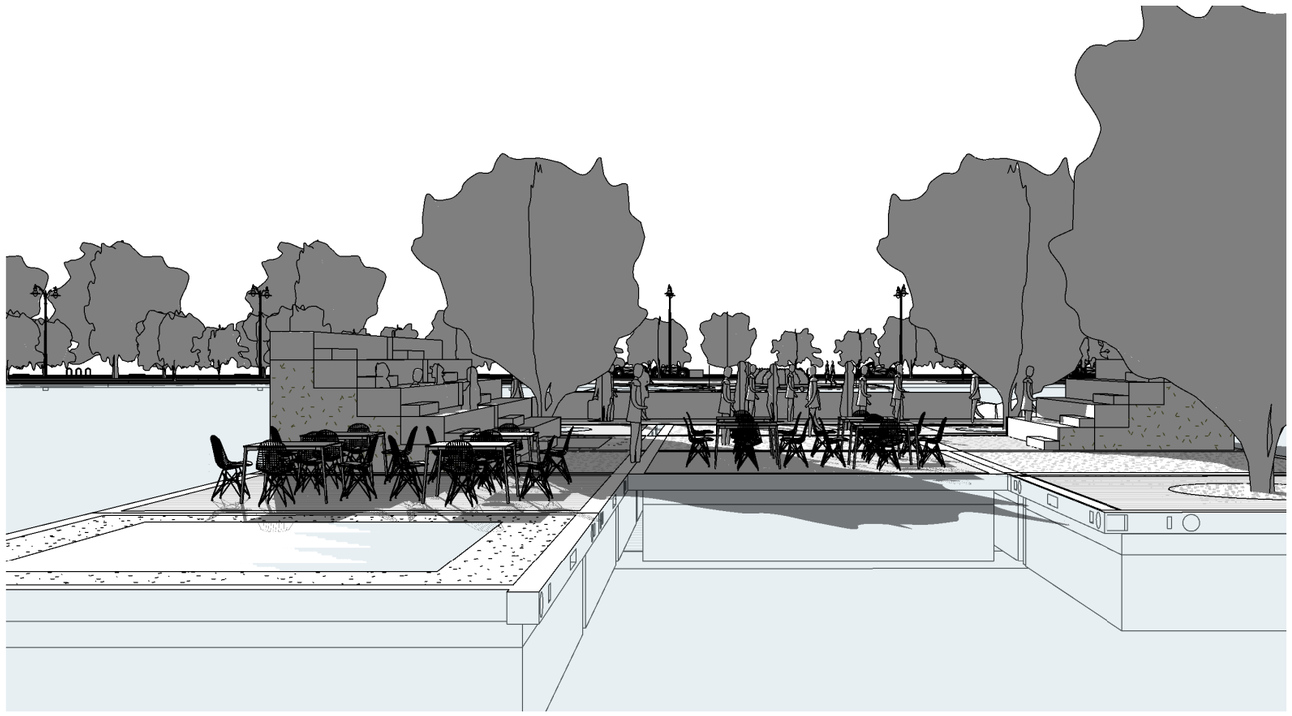
By attaching them different configurations can be achieved, the project could grow and respond to several cases.



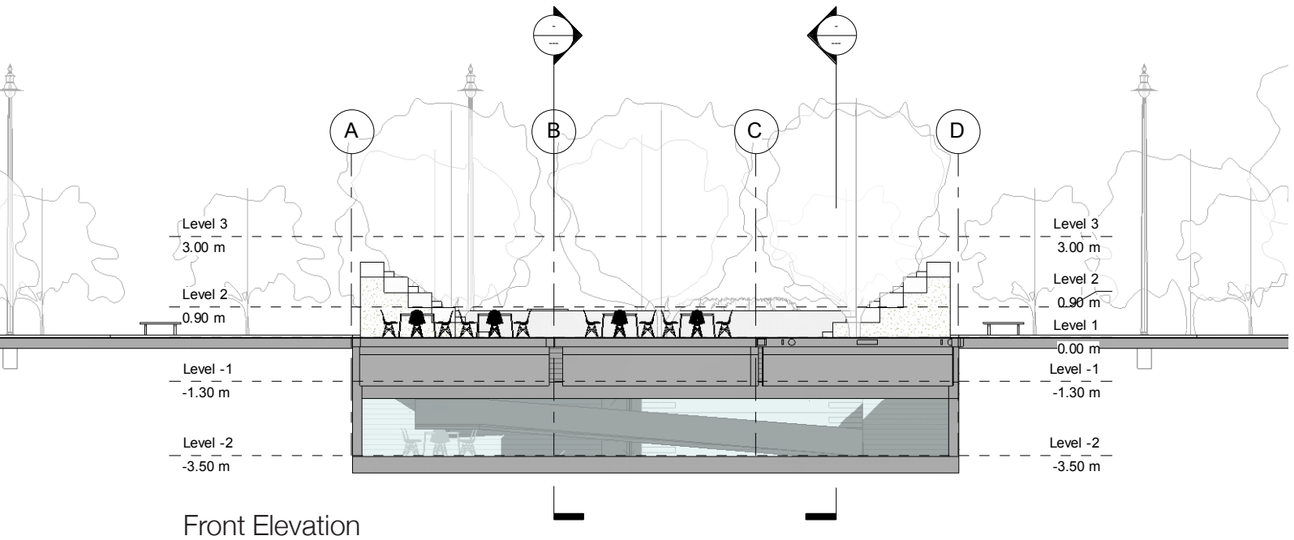
Site plan



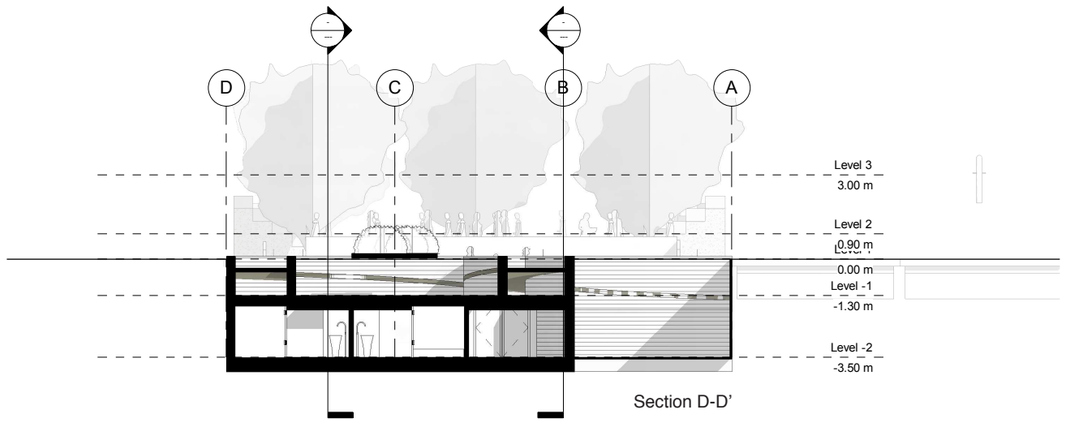
Level -1



Front Perspective



Front Elevation

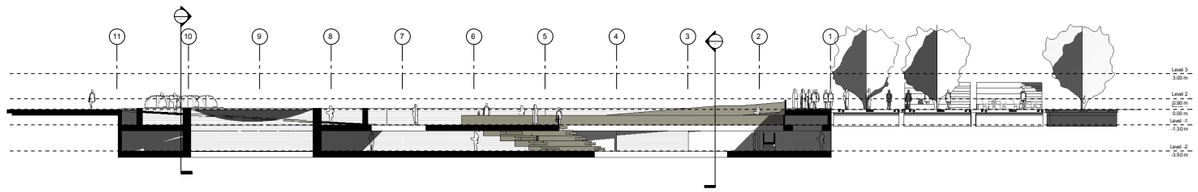


Section D-D'

The project is organized with criteria of horizontal organization, its designed in section to hide in the water and invite the user to see what is happening.

In the ground level, a wide open space is provide in order to connect the user with the water wich is in the eye level height. Ramps and stairs ascending to 1.30m where the platforms level enhanced the development of the different uses the space can experience.

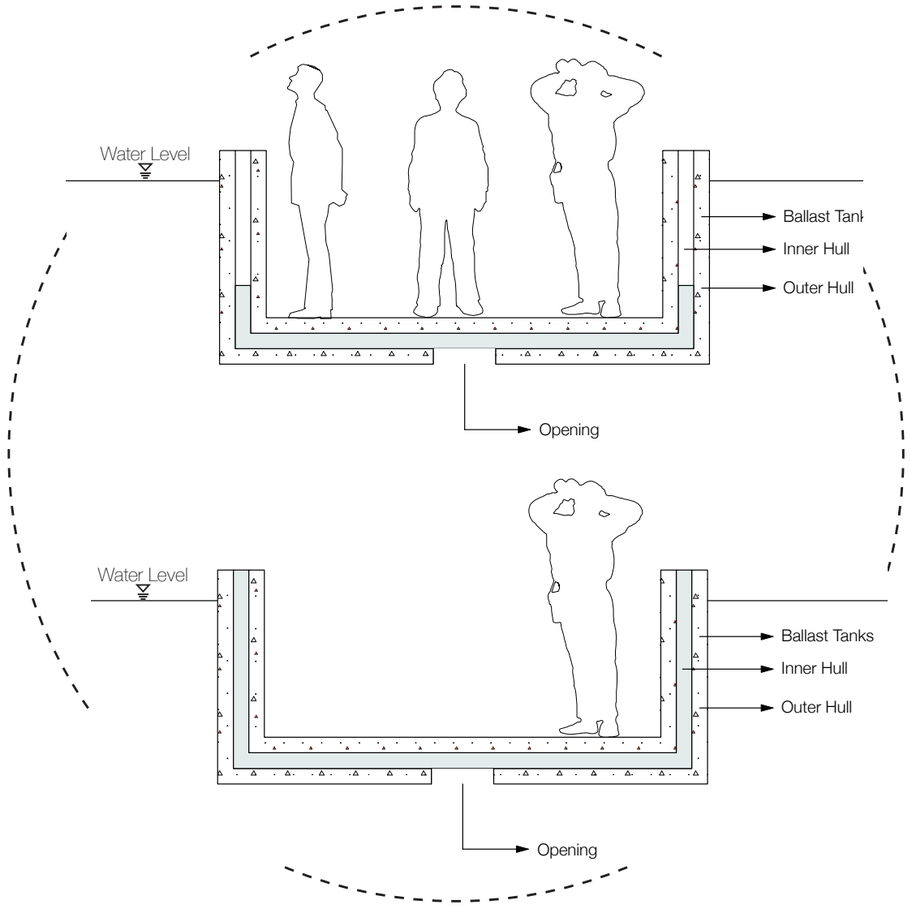
In the underwater floor, general services as bathroom, machine rooms and storage are located along with lounge areas where the user can appreciate the underwater experience.

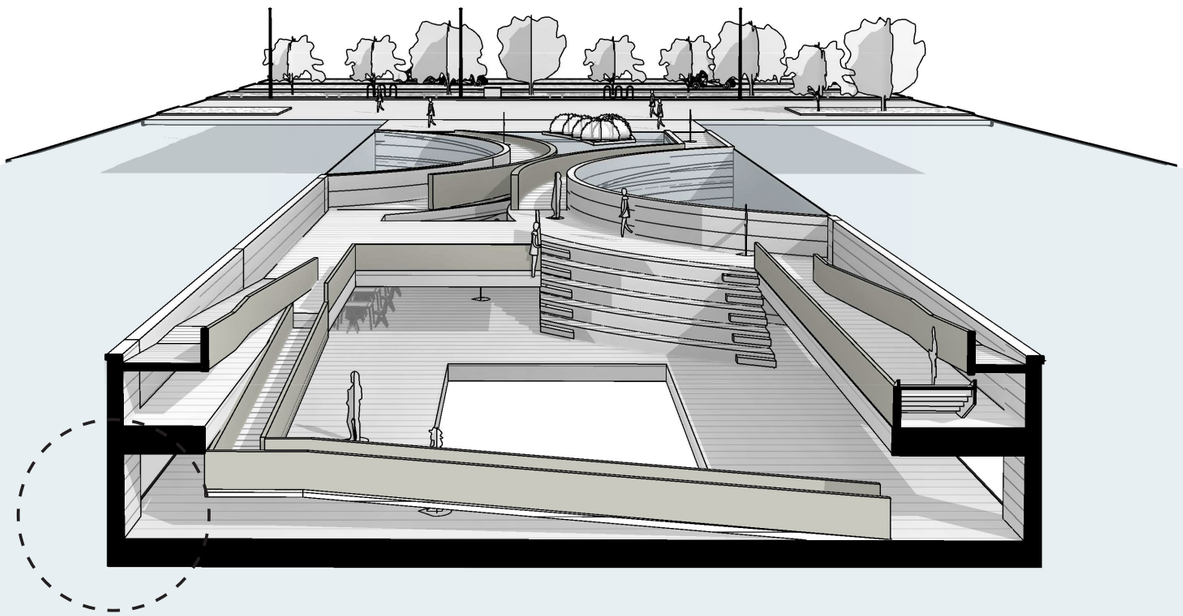


Section A-A'

S Y S T E M

Side A

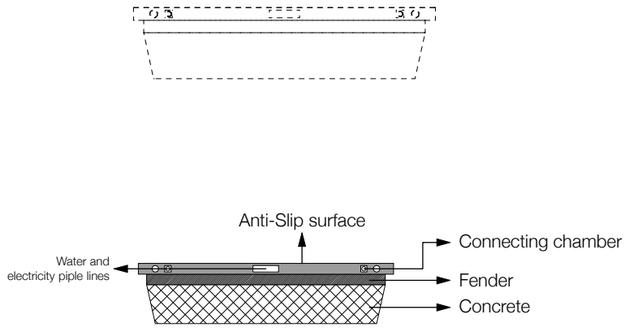




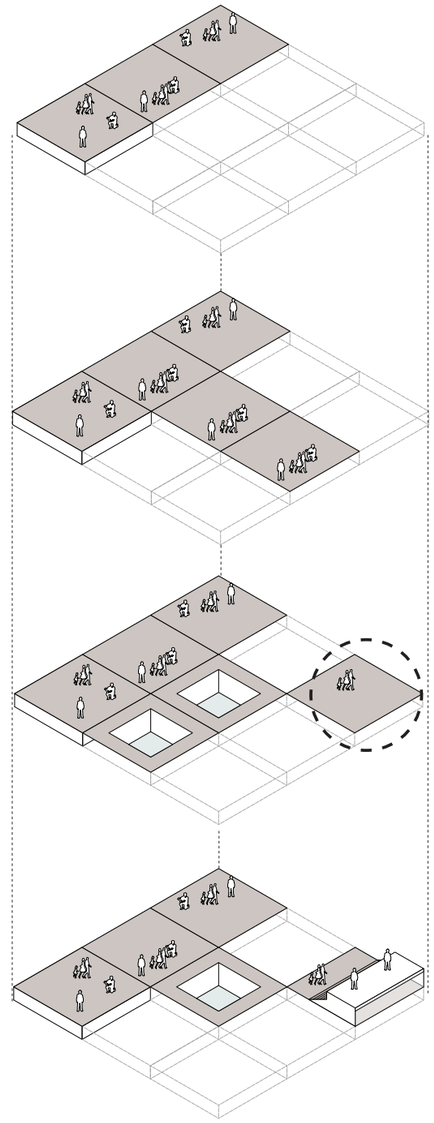
Side B

Modulation proposal

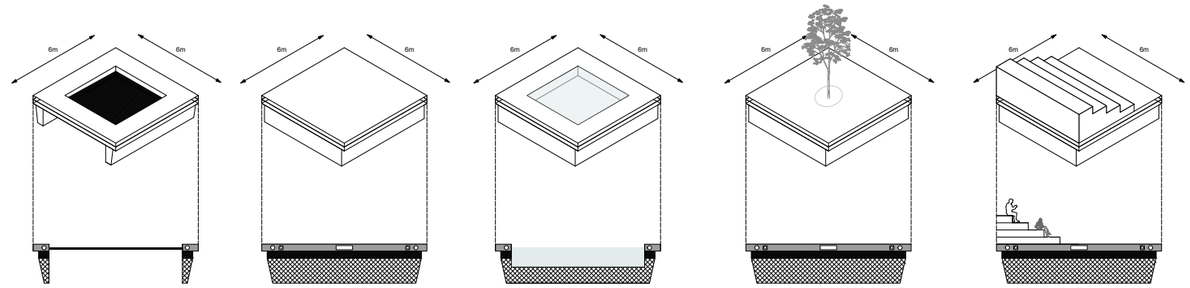
In order for the project in the side A to sit directly on the water it will be supported upon a series of air chambers that automatically open and close, releasing or taking in water according to the number of people that are walking on the surface seeking to stay in the eye level height.



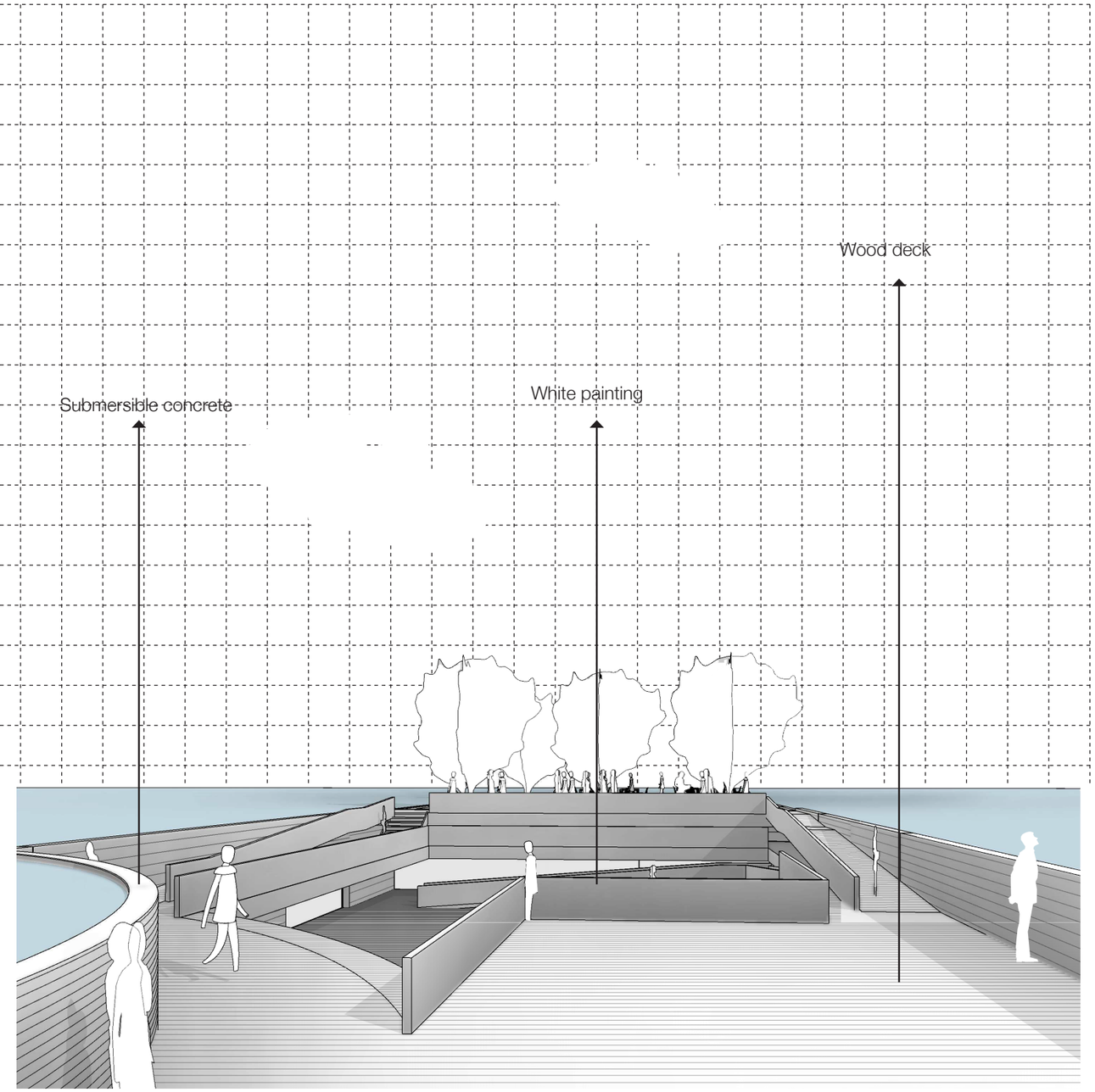
Concrete pontoons details



Platforms catalog



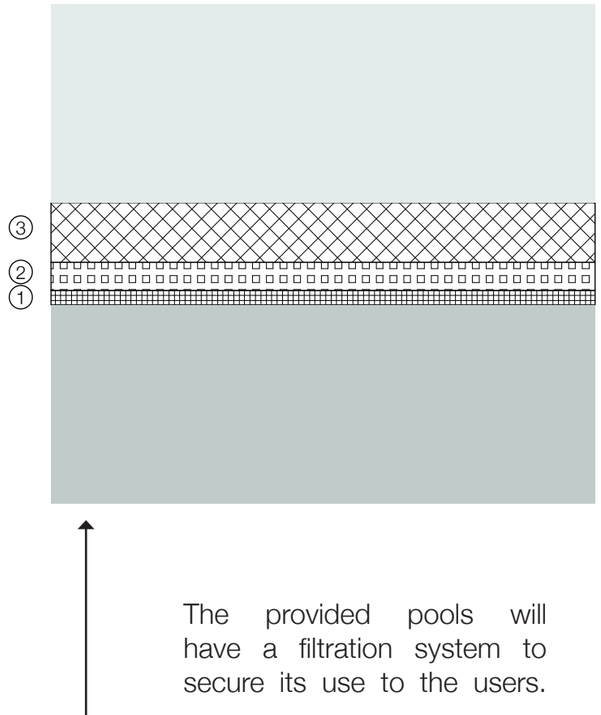
DETAILS



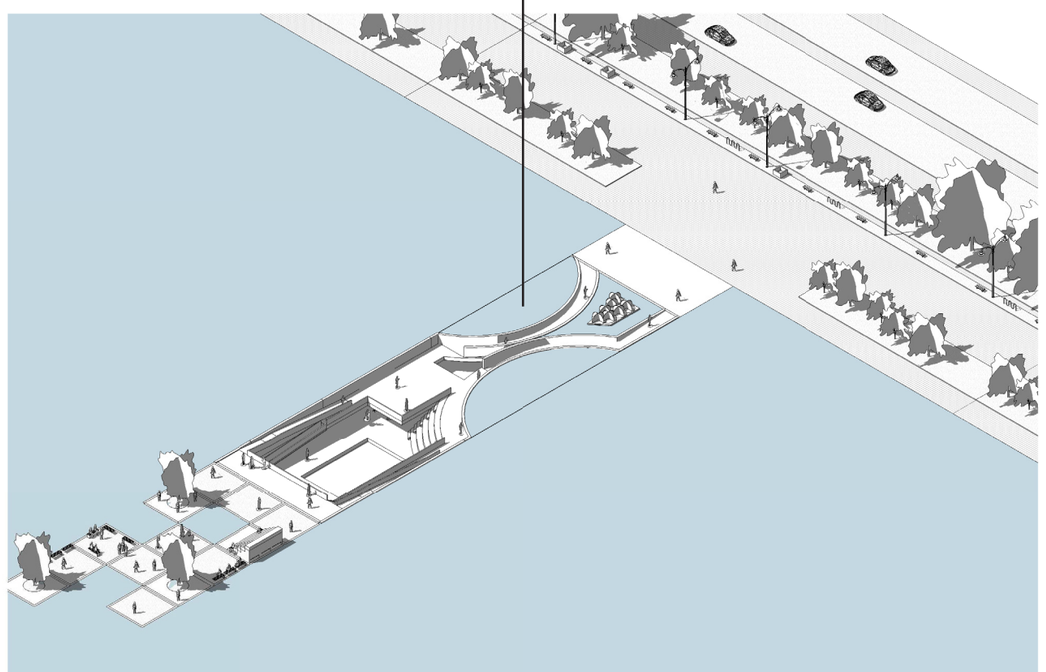
1. Primary Filtration
Prevents dirt particles intrusion

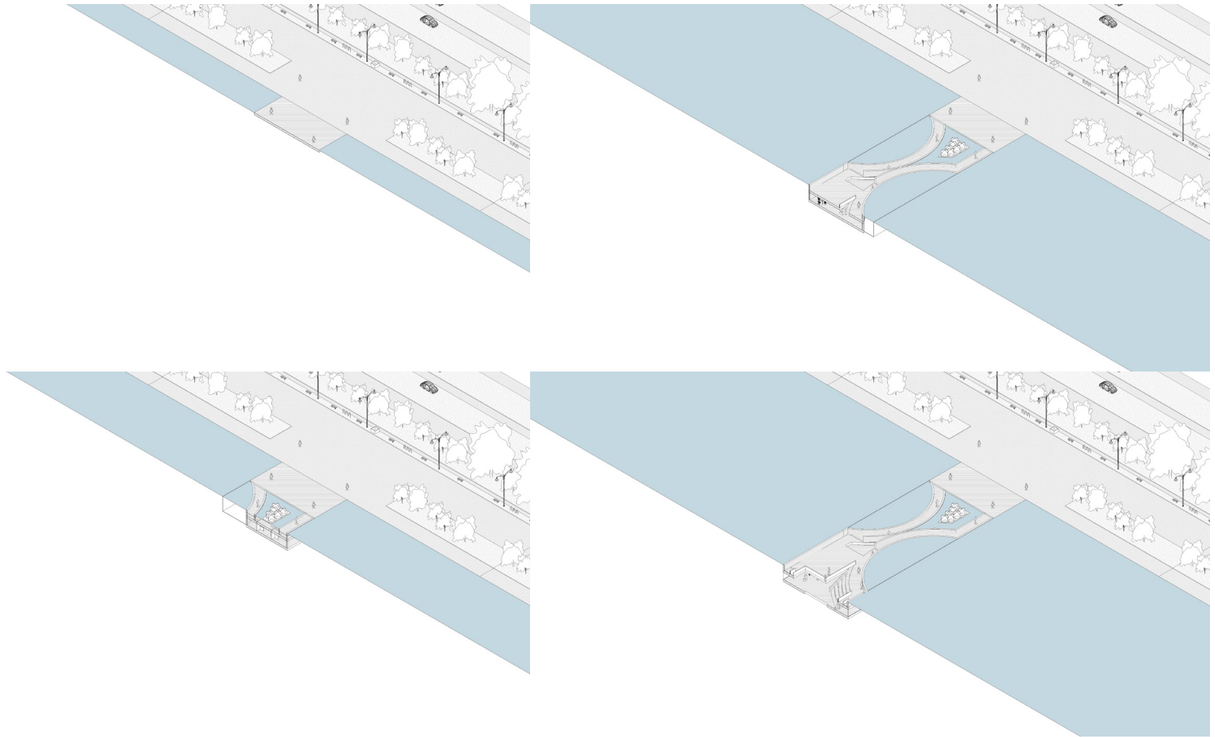
2. Secondary Filtration
Removes soft particles

3. Desinfection
Eliminates micro particles and desinfects the water

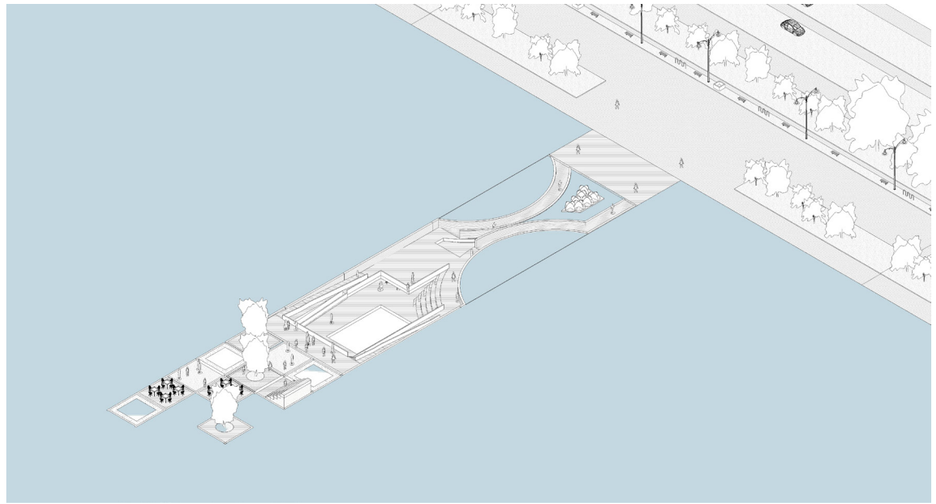


The provided pools will have a filtration system to secure its use to the users.





STRUCTURE



The prefabricated submersible concrete system is used for the advantage that it serves as a shell and does not interrupt the internal areas of the project. In turn, the system allows to give the necessary lightness to the structure to be able to maintain its shape, but without ceasing to be resistant and capable of supporting the loads.

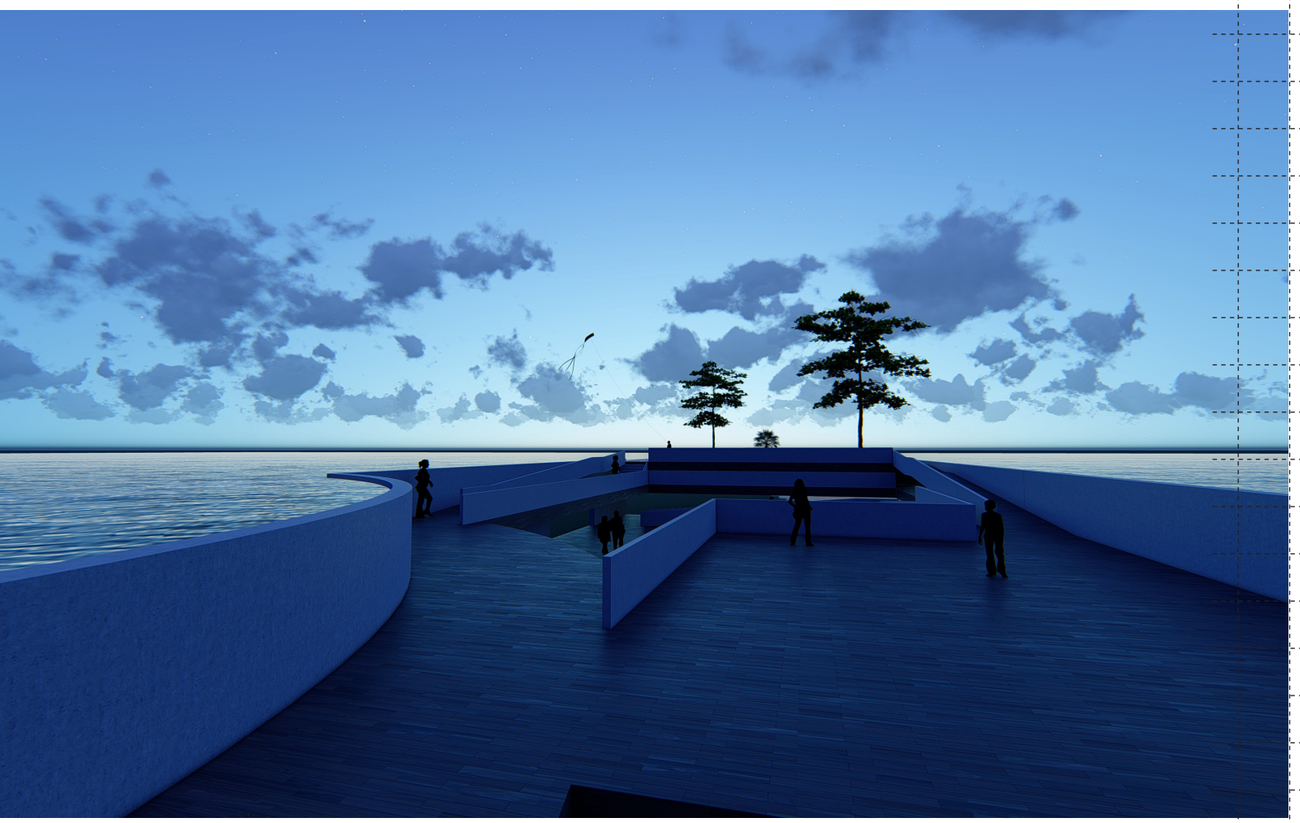
The concrete platforms are the most used. Generally constructed of reinforced concrete divided into interior sections to ensure buoyancy. As in a boat these divisions function as watertight walls in case of rupture of the outer hull.

Initially these exterior spaces were filled with expanded polystyrene or they were also built as a full house where the outer hull was made of reinforced concrete and the interior was a mixture of expanded polystyrene and cement.
Its height is more than one meter and today the interior space of the platform is used as a living space or as a service area.

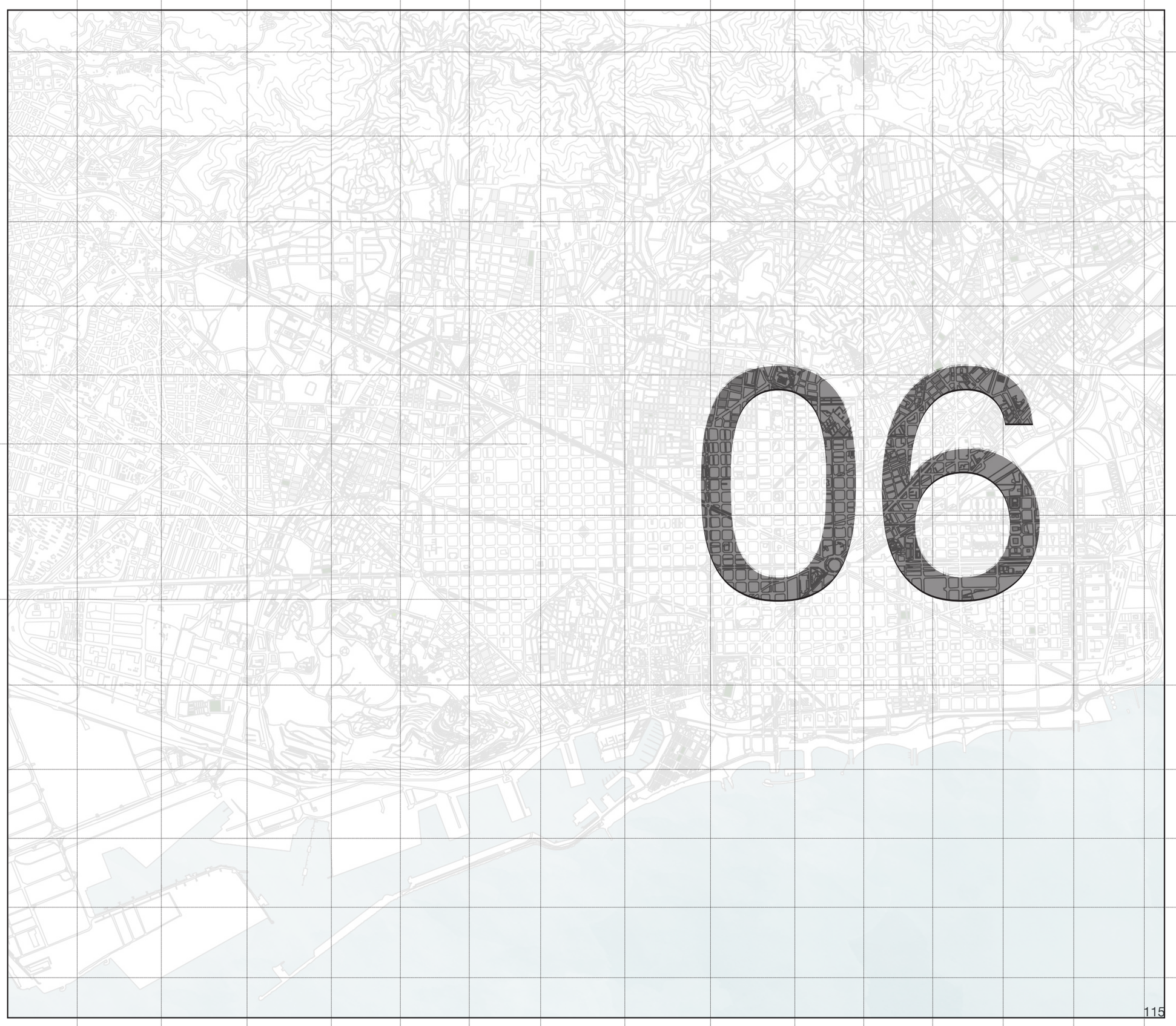
3D View

3D View

3D View



3D View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